Risø-R-1284(EN)
CHMI-02-01

A Web-Based - Multimedia - Collaboratory

Empirical Work Studies in Film Archives

A.M. Pejtersen, H. Albrechtsen, B. Cleal, C.B. Hansen, M. Hertzum

Risø National Laboratory, Roskilde
June 2001

ISBN 87-550-2919-1; 87-550-2920-6 (internet)

ISSN 0106-2840

Print: Pitney Bowes Management Services, 2001

ABSTRACT

This report represents the latest study in the activity on Ecological Information Systems conducted in the Center for Human – Machine Interaction situated at Risø National Laboratory and the University of Aarhus. The purpose of this activity is to give a description of the characteristics of work domains that will serve to outline the general context of concern to design of collaboratories. In addition, a set of preliminary implications for the design of a collaboratory are derived from the cognitive work analysis. To anticipate, further research on this approach to the design of collaboratories will show how the preceding analysis is likely to lead to a novel theoretical framework, called Ecological Collaborative Information Systems (ECIS), required for the design of collaboratories. The intention is to illustrate how the general principles of ECIS can be instantiated to develop a concrete design product: A crossdisciplinary and cross-cultural collaboratory to support customer service and professional research in archives.

A web based Collaboratory

Numerous valuable historic and cultural films and their sources are scattered in various national archives. Knowledge and usage of the multinational film material are severely impeded by access problems. To fully exploit the cultural film heritage internationally, a high degree of cross-disciplinary and international collaboration among professionals working with the film media is required.

The Collaboratory for Annotation, Indexing and Retrieval of Digitized Historical Archive Material (Collate) is intended to foster and support collaboration on research, cultural mediation and preservation of films through a distributed multimedia repository. The collaboratory will provide web-based tools and interfaces for collaborative work and content-based access to digital repositories for film archives, researchers and end-users.

This work is based on empirical analysis of three film archives in Germany, Austria and the Czech Republic, and seeks to elicit the user needs for a collaboratory in this domain. Both the collection and analysis of data have been organised according to principles of Cognitive Work Analysis (CWA) as pioneered at Risø (cf. Rasmussen, Pejtersen & Goodstein1994). Following this approach work within the archives has been categorised into discrete functions; achieved through applying a means-ends abstraction hierarchy to the empirical data. This produces a textured picture of work activities in the film archive domain and the collaborations that support them.

Collaboration here refers to interactions between humans, between humans and machines and between machines. The empirical analysis of the archives indicates that all of these collaborations are extremely mediated. Information management tools are only used by experts and expert knowledge is often needed to satisfy information retrieval requests. The prevalence of stand-alone databases compounds this, as expert knowledge is also needed to elicit connections between information that is stored on different media. Research based work on individual film projects is, due to international distribution and multiple versions, also dependent on collaboration with international colleagues who mediate access to their collections.

Away from information seeking activities, the need for collaboration is also evident in the work done on classifying and cataloguing materials. In this case of cataloguing, mediation and collaboration are more systematised due to the fact that all of the archives involved worked according to international principles established by the Federation of International Film Archives (FIAF). The potential advantage of this was witnessed in the fact that two of the archives were able to produce national filmographies in which certain information could be conveyed in an international language.

Examining user-requests to the archives this report was able to draw on information collected by one of the archives relating to e-mail inquiries. Based on analysis of the raw data it proved possible to produce an analysis of the type of information requests that archives receive, the nature of the information they require and the kind of information they provide in terms of contextualising their interests.

It is axiomatic to CWA that empirical analysis should provide the necessary conditions for identifying design requirements. In this study there is an extra layer of complexity in that the focus is on three institutions, which, though located in the same work domain, are significantly different in their organisation. The approach adopted in this report is, therefore, one that seeks to suggest implications for the implementation of a collaboratory system according to the organisation of the archives. Here it

is stressed that there will be important differences in how a collaboratory will impact on a hierarchically organised work-place as opposed to how it would impact on a work environment that operated according to self-organising principles.

Acknowledgement

This research has been funded by the Danish National Research Foundation and by the EU Information Society Technologies Programme. We gratefully acknowledge both sponsors, in particular the support from the Danish National Research Foundation, which has made it possible for the Risø group to work closely together in a fruitful crossdisciplinary effort to understand the work at archives. This work has greatly improved our common understanding of the problems involved in the design of collabotative information systems based on the ecological approach involved in Cognitive Systems Engineering. Without this support our comprehensive field study would not have been possible.

Table of Contents

1 Structure of the report

The report consists of 12 sections.

Sections 2 contains an extended summary of the report. The section is followed by two introductory sections 3 and 4 that briefly outline the purposes of the report, Risoe's role in relation hereto and the goals and contents of the COLLATE collaboratory.

Section 5 offers an overview of the state of the art within the areas of collaborative information retrieval and collaborative classification. The section furthermore presents some existing collaboratories and digital collections.

In section 6 the principles and methods that Risoe has applied for the execution of empirical field studies and the subsequent data analysis are described.

Sections 7, 8 and 9 consist of the work analyses done on basis of the empirical data collected at the three archives Filmarchiv Austria, Austria (FAA), Národní Filmovy Archive, The Czech Republic (NFA) and The German Film Institute, Germany (DIF). The analyses are a prerequisite for the development of evaluation criteria. The focus is on the goals, priorities, work functions and tools of the archives. Particular emphasis is placed on the collaborative information seeking and cataloging work tasks being performed at the archives. Other important aspects of the archives' work are the actors of the archives, their collaboration, communication and use of task-specific tools. Because of the fact that the archives differ in their approaches to work organisation and work functions, some aspects of the archives are treated more thoroughly in one archive than in others. The concluding paragraphs of the three sections provide an analysis of the needs that should be supported at the three archives.

Section 10 discusses the possibilities and constraints in relation to the development of a collaboratory among the archives. Here the focus remains on information seeking and cataloging but in addition to this the actual organisation of work at the archives is addressed.

Section 11 provides conclusions to the current work analysis and user behaviour at the archives.

Finally section 12 contains references to the literature used for this report.

2 Extended summary of the report

2.1 Background and motivation

Numerous valuable historic and cultural films and their sources are scattered in various national archives. Knowledge and usage of the multinational film material are severely impeded by access problems. To fully exploit the cultural film heritage internationally, a high degree of cross-disciplinary and international collaboration among professionals working with the film media is required.

The Collate tool is intended to foster and support collaboration on research, cultural mediation and preservation of films through a distributed multimedia repository. The tool will provide web-based tools and interfaces for collaborative work and content-based access to digital repositories for film archives, researchers and end-users.

The design and evaluation of the Collate tool should ensure:

- Enhancement in the *quality* and effectiveness of work by providing access to materials and knowledge that are otherwise not accessible
- Increasing international *collaboration* among experts and users of the materials stored in the collaboratory
- *Knowledge acquisition* through professionals' analysis, evaluation, indexing, and annotation of film materials
- Collaborative *accessibility* of a content-centric, user-driven information system and working environment
- *Acceptability* of a collaboratory in the film domain by the professionals' through real-life experiences of collaborative work with the tools of the collaboratory

The present report provides a qualitative work analysis of the users' needs for the Collate multimedia collaboratory. The work analysis is based on field studies in the film archives involved in the Collate consortium: FAA, NFA and DIF. This work is the basis for the empirical evaluation of the interface design, user acceptability, accessibility and collaborative facilities of the prototypes of the Collate tool. While all work functions in the archives are covered in the present work analysis, the emphasis is on collaborative information seeking and collaborative cataloging, classification and indexing.

2.2 Methodology: Cognitive Work Analysis

The Cognitive Systems Engineering framework has been developed as a general approach to analyse and evaluate the complex interactions between (a) the activities and organisational relationships and constraints of work domains, and (b) users' cognitive and social activities and their subjective preferences in complex work. The framework is based on generalisations from field studies which led to the design of information systems for a variety of modern work domains such as process plants, manufacturing, hospitals, libraries and archives.

For dynamic work, such as work in archives, stable work procedures are not the norm. Most of the time, tasks are discretionary and explicit consideration of goals and constraints is necessary. Great diversity in behavioural patterns is found among the members of an organisation. No two individuals are occupied with the same activity; nor will a task be performed in exactly the same way twice. The variety of options with respect to 'what to do when and how' in dynamic work situations is immense. In order to understand why a particular piece of behaviour is chosen we have to understand the action possibilities in a particular situation, and how a particular action is chosen. In other words, we have to identify the *constraints* which guide the choices taken by the individual together with the *subjective performance criteria* which are applied by the individual actors to choose among potential action possibilities.

The unit of analysis in dynamic work is not the "task" only. It includes all the features of the work environment and the interpretation of these features by the actors, all of which in collaboration create

the task ad hoc. The units of analysis are (1) the constraints and possibilities of the different work domains and (2) the competence and performance criteria and subjective preferences of the individual actors in the work domains. Several different perspectives of analysis are necessary to bridge from a description of work domain characteristics to a description of human characteristics.

The overall research questions for the present work domain analysis are as follows:

1. What are the services of the archives: what kind of collections and products do the archives offer? Who are the users of these services, and what kinds of needs do the users express?

2. What kinds of tools/information systems do the archives apply for their services: databases, manual files, spreadsheets, e-mail, Internet tools?

3. What kinds of collaboration among staff take place within the archives, and with outside parties, like institutions and individual persons, and for what kinds of tasks? How are the services planned and coordinated in the long term as well as on a day-to-day basis? In what kinds of professional networks does the staff participate?

4. What are the overall goals and strategies of the archives, and how are the organisations structured? How is the relation between staff and managers? How is the division of labour and delegation of tasks decided? What kinds of competencies and skills does the staff have, and how does staff share expertise, ideas and work tasks with one another?

1. What kinds of future developments does the staff of the archives envision? For instance, visions of digitised archives, information technology, collaboratories, user services, new professional roles?

These research questions were addressed through field studies in the archives, followed by qualitative data analysis and discussion with the informants about assumptions and preliminary results.

The qualitative approaches to data analyses are means-ends analysis of institutions and actors as well as analysis of collaboration and task situations, with particular emphasis on the task situations of information seeking and cataloging/classification.

2.3 Work domain analysis of the three archives

This report provides a qualitative work domain analysis for each of the archives involved in Collate: Filmarchiv Austria (FAA), Národní Filmovy Archive (NFA) and Deutsche Film Institut (DIF). Data was collected through field studies and ongoing contact and collaboration with the archives. Data analysis has involved staff at Risoe as well as staff in the archives in order to ensure validity of each work domain analysis and the conclusions on the most important user needs for collaborative tools.

Furthermore, a comparison of the user needs for the three archives is provided.

Goals and intentions

At a basic level, it is possible to identify common goals for the three archives. The role as protector and mediator of cultural heritage is one which they all embrace. Each archive has an interest in increasing the visibility of their services and collections to the public domain, for instance through increasing activities in international collaboration on research, mediation and preservation. For the goal of visibility and service to the public domain, the archives apply different strategies.

FAA's commitment to the public domain is seen in the commitment to and realisation of user services. More than simply providing end-users with good resources to access FAA's information content, the goal at FAA is to anticipate user interests and develop the archive's collection accordingly. This philosophy is based partly on a particular vision of archives as "information centres". However, it is also based in the belief that end-users are a potential source of expertise that can both assist archivists in understanding their collection more fully and contribute directly to the available knowledge about specific films, personalities or events not available to the archive from other sources.

NFA has a clear commitment to the public domain in their role as a national institution. They emphasise their role as custodians of unique material that has both national and socio-historical importance. It is against this background that NFA's emphasis on preservation and acquiring new

material should be understood. In the services they provide users they supply information about the archive and its information content, primarily through expertise of the staff.

At DIF it is possible to identify a commitment to the public domain that reflects aspects found in the other two archives. There is, for example, a similar commitment to user service as seen in FAA. For DIF this is, however, primarily about improving the organisation of and access to its information content and less about seeking inspiration directly from users. At the same time DIF also strives to provide services that inform the public about its collection and the activities with which it is engaged. One strategy in this respect is to conduct basic research work that will contribute to the public understanding of filmmaking and film history.

Legislation and policies

One constraint that does impact more or less equally on each archive is legislation. This may be national legislation relating to archiving, international copyright law and, finally, the code for ethical conduct issued by FIAF, Fédération Internationale des Archives du Film. Such issues of copyright and ownership of material is a very tangible constraint that determines to what extent the archives are able exploit and mediate their collections. All three archives have a well-developed policy for the selection of materials. The purpose of these policies is among others to secure high quality of historically important material. These policies serve to implement goals and priorities of the archives. For the specific purpose of the COLLATE collaboratory, a common policy can be developed reflecting the goals of work the censorship domain.

These observations are important for the evaluation of the acceptability of the Collate tool, and in particular for evaluating in what way the tool may enhance the quality and effectiveness of work with censorship materials. It will be an important theme in the next phase of the present evaluation study.

IT Tools

Due to the tight coupling between the institutional context and investment in information technology, the archives have each developed their particular configuration of information resources. The result of this, seen from the perspective of Collate, is that there is a lack of equivalence in the information technology resources available to the archives. This lack of equivalence varies according to the nature of the system at issue. For local databases, therefore, it is clear that NFA's local resources are much more developed and sophisticated than those at DIF and FAA. In contrast, access to global systems, such as Internet and e-mail, is most restricted at NFA. Although this is not a problem as such it will mean that access to Collate will be more or less open to archive staff depending on the institution in which they work.

For the evaluation of the Collate prototype, this issue is important to elicit the users' needs and preferences for how to couple local resources to the global opportunities offered by the Collate tool. Thereby, it will be possible to explore how international collaboration and visibility of the archives' collections and services can be increased, while still adjusting to local needs and tools.

Work organisation and collaboration

DIF is undergoing a transition from a traditional hierarchical organisation to a project organisation and now has a very flat organisational structure where many of the work activities are organised in projects. FAA is characterised by being a hierarchical organisation that consists of self-organising groups, which arrange their work activities according to the overall framework provided by the management. Project groups are however also a part of the organisation. NFA has a hierarchical organisational structure and the management and the heads of the departments coordinate the work. As in the other two archives project work is also performed at NFA. These different kinds of organisational structure influence work coordination as well as communication at the archives. The actors at the more self-organised archives have more influence on their own work tasks and are, in some cases, more used to communicate through alternative communication channels such as for instance the Intranet and Internet.

For the evaluation of the Collate prototype, focusing on the censorship case, these differences in work organisation aren’t likely to be crucial themes in the short term. The actors that are enrolled in the censorship case have a commitment to share knowledge and develop their research field through the collaboration with other experts. However, the evaluation of the prototype will closely follow developments of professional roles and communication patterns among the actors involved in order to

make observations on how the Collate tool may - in the long term - inspire new collaboration forms and coordination of work.

Actors' knowledge and expertise

The majority of the actors in FAA, NFA and DIF have academic backgrounds within the areas of history, drama, film theory, film history and information science. Actors possess a detailed and extensive knowledge of the film domain and intersecting disciplines, such as history and linguistics. In addition, the actors have archive domain expertise (knowledge as well as skills), acquired through their educational background or through their work experience in the archive. Further competence development is achieved through national and international professional networking, educational activities for archivists and development projects, such as Collate. The actors in the archives complement and extend each other's knowledge and thus provide a comprehensive knowledge background for a collaboratory that enhances this opportunity for high quality work. The archivists use their specific knowledge in their daily work at the archives within the areas of user service, organisation of materials, research and restoration and preservation. The Collate prototype provides a unique opportunity for sharing knowledge and expertise. At present, there is a fairly even distribution of knowledgeable actors that have worked together for many years at the respective archives and newcomers to the field.

For evaluation of the Collate prototype, an important theme is how the archivists can transfer their knowledge and skills to the web medium. The interactive features of the Collate prototype is a unique opportunity to continue the current practice of learning by doing and following the examples of more experienced colleagues. Through the provision of such interactive features, the collaboratory can function as a tool for exploiting expert knowledge on 'best practices', 'recommended sources', etc., developed by regular staff at the archives. Knowledge exploitation could be done for individuals as well as for groups of staff, ranging from descriptions of one person's expertise (and for key staff especially) to forums created for discussions of particular shared professional developments and challenges, and for IT development, preservation, information seeking and cataloging.

Knowledge about IT, web and collaboratories

The actors of the three archives have varying degrees of experience with information technology, and the use situations are quite different at the respective archives. The majority of the actors work with PCs in their daily work in all the archive departments and are as such familiar with inputting and seeking information by means of internal databases and the Internet.

FAA and DIF have created web sites that are used for visualising the activities of the archives, as well as Intranets that serve as internal notice boards. Access is provided to search engines and to film related institutions. None of these web sites are used for communication with end-users or collaborating institutions, except for providing contact email information, or for internal debate among the archivists. Consequently, none of the archivists are used to communicate in a virtual environment. Furthermore the NFA actors currently seem to have relatively little experience in web publishing.

A common trait among the archives is that they are short on IT personnel that are exclusively responsible for maintenance and development of the information systems and PCs. The archives all have positive attitudes towards using technology more effectively than is presently being done. This attitude could affect the use and acceptance of the collaboratory in a positive way. At DIF, the IT function is divided between three archivist that are not professionals within this field. At FAA and NFA one person takes care of the entire technology department for each of the archives.

2.4 Collaborative information seeking, cataloging, classification and indexing

Collaborative information seeking, classification, indexing and cataloging are key activities in all three archives. Because these work functions are crucial elements in the Collate prototype as well, the present work domain analysis has focused on how these functions are currently carried out in the archives. What actors are involved, how do the actors communicate with the end-users, and what kind of tools and resources do they apply. Through the introduction of the Collate system, a number of innovative opportunities are offered for collaboration on these tasks. Among the most important opportunities found through qualitative analysis of the users' needs are:

Collaborative information retrieval

Many of the activities in the three archives are collaborative, and while the collaborating parties are sometimes co-located they are often physically distributed. The collaboratory could enable physically distributed archivists to meet online to collaboratively formulate information needs and search for information on specific issues. This way the collaboratory would support a broader range of activities than the situations in which one archivist needs information and another already possesses it.

End-user access

A web-based collaboratory provides an obvious opportunity to allow any interested person – as opposed to professional archivists only – to search the collections. Websites are increasingly becoming an established way of communicating information to a world-wide audience. Such a window into the archives would also increase the visibility of the archives and provide a means of disseminating their work and services. necessitate a pay-per-view scheme for some of the materials.

Overview of available sources

In determining what resources to mobilise in order to answer a request archivists – or possibly end users – need an overview of the available sources: people involved in the collaboratory, materials in the collaboratory, and institutions, persons, and materials external to the collaboratory. Such an overview would allow archivists/end users to recognise rather than recall useful resources.

Known-item retrieval

In a number of situations the archivists know exactly what they are looking for and expect to be able to look up this particular film, document, poster, etc. These searches are often done on the basis of the title, year, and – possibly – the director of the film in question. Known-item retrieval is an effective and direct way of extracting material from the collaboratory.

Subject retrieval

A number of the users of the archives are not interested in a specific film but in a specific subject. Facilities for subject retrieval would enable the archivists to use these users' subject descriptions directly as queries, rather than being forced to translate them into search attributes such as film titles and directors. While experienced archivists may be able to perform such translations based on their knowledge of films, less experienced archivists – and end users – will often not be able to do it.

Similarity retrieval

Facilities that enable the archivist to search for material similar to a piece of material that has already been identified will relieve archivists from the difficult task of expressing their information need in abstract query terms. The email requests provide many examples of requesters using a particularly good example of a film suiting their needs as a primary element in their formulation of their request.

Exploratory retrieval and browsing

In line with facilities for providing an overview of the available sources, users will need facilities for exploring the collection to see, in more detail, what is there. Techniques for inviting exploration, for example hypertext and information visualisation, enable users to recognise what is needed, rather than making retrieval conditional on their ability to specify what they want. Thorough classification/ indexing provides opportunities for generating many links automatically and for presentation of explicit structures that can support exploration.

Filtering of incoming requests

Based on a registration of the competencies and special interests of the staff the collaboratory could route incoming requests to a person capable of answering it. This would provide requesters with one entry point when they wanted to post a request, and it would relieve the staff from forwarding requests to more competent colleagues. Further, the first step in handling the requests could be to automatically match them against a set of frequent questions for which standard answers have been made. Answering some requests in this automatic way would safe staff hours.

Collaboration among experts

All archives are involved in a number of international collaborations. These collaborations flourish even though there is no information resource available that really supports collaboration initiatives. Through the archives' participation in FIAF and through the personal initiative of staff a collaboratory could include extensive links with the international film archive community and related institutions both inside and outside of the countries. The collaboratory could have links to the staff of the archive and all the experts that are collaborators of the archive. This requires a standardised scheme that can be used to classify the important features of the experts working with topics such as censorship, preservation, information retrieval and cataloging. A scheme is also required to make compatible and relevant information available about the experts in institutions. This will help the process of teaching novices about the expertise of all their colleagues, it will help experts to remember experts by browsing, and finally, it will be very important for a web-based collaboration with other national and international institutions.

Focus on the institutions behind the collaboratory or on available web resources

In addition to resources already available in the collaboratory, other online collections will be of interest to the users as they are readily accessible. A rich set of annotated links to other resources would weave the collaboratory into the World Wide Web and, thereby, strengthen the focus on the subject matter, European films from the 1920s and 1930s.

Collaborative cataloging, classification and indexing

The classification facilities in the collaboratory can focus on standardising the ordering of knowledge and media as well as opening up to embracing diversity in conceptions of how the media could be arranged to comply with different views of knowledge and local adaptations to particular tasks in the collaboratory. Through standardised global orderings or classifications, an overall stability of the semantic basis of the collaboratory is ensured. Through diverse orderings, adaptations to local work context and workspaces are supported. Both types of classifications represent invariant structures of the multimedia collaboratory and constitute opportunities for collaboration between the actors in the collaboratory on understanding and developing shared conceptions on arrangements of media. Common information spaces for teamwork or individual work across locality or within a particular locality could be created dynamically through couplings between local schemes as well as couplings between local schemes and more global schemes.

Multimedia information model and flexible management of metadata

Management of invariant structures in the collaboratory can be enabled through different approaches, ranging from centralised to distributed approaches, and combinations of both. In a centralised approach, only the archive staff in the collaboratory manages metadata. The responsibility can even be delegated to specialists among the staff. In a distributed model, all actors contribute to managing the metadata. In a combined approach, archive staff is responsible for the provision and maintenance of metadata in the collaboratory, while simultaneously allowing for contributions by all actors in the collaboratory that can add enrichments to database information in the shape of keywords, summaries, comments and annotations. The COLLATE approach envisions developments of advanced tools for metadata management, including text processing tools and meta-thesauri for switching between classificatory perspectives.

Multimedia data exchange and reuse

Reduction of duplicate work for catalogers in local archives through reuse of data from other institutions, including all archives involved in the collaboratory. A further opportunity is reduction of duplicate work for individual catalogers or teams of catalogers in institutions where cataloging data cannot be interchanged through local networks and tools. Finally, possibilities include increase in the quality of local catalogs.

Facilitating professional networking in multimedia classification and cataloging

Presently, the staff in all COLLATE archives has unique expertise in multimedia classification and cataloging. At the same time, there are currently very few formal educational and training programs within this area of expertise. The collaboratory could provide facilities for sharing competence, ranging from general introductions to multimedia cataloging in online tutorials, to interactive forums for sharing particular expertise, including 'best practice' developed within one institution etc.

Collaborative multimedia subject analysis and indexing

Collaborative subject analysis and indexing of multimedia materials in the collaboratory could be supported by a number of tools, such as faceted schemata that are tailored for subject analysis of specific media types (films, images, books, videos etc.) and their possible applications and uses in the collaboratory. Furthermore, access to context information for each type of document could be available through offering direct access to:

1. Stable information, such as electronic dictionaries and encyclopedias, common thesauri and classification schemes.
2. More dynamic context information, such as other documents for subject analysis of films: reviews, censorship documents and previous requests by users and their solutions.

Access to such context information will not only support subject analysis of the multimedia documents, but also provide inspiration on how to express the subjects in indexing terms. For instance, access to user requests can facilitate expressing the subjects in the users' terminology. Furthermore, collaboration on subject analysis of media requiring a high degree of domain knowledge and documentation effort could be furthered through interactive online screening meetings, or online consultations between experts across staff and expert users involved in the collaboratory. Overall, such opportunities could enhance the probability of harmonised subject access to collections in collaboratory, across archives and databases.

2.5 Future work

The next phase of the empirical evaluation work will address the Collate prototype in work (D9.2). The evaluation will consist of field experiments with archivist users working with the censorship case, in real life settings, as well as laboratory experiments with the advanced tools for text analysis, indexing, retrieval and annotation. The experiments will be based on task situation analysis for the censorship case in real life settings.

The first part of the next evaluation phase will focus on the collaboratory's opportunities for *knowledge acquisition* through subject analysis, indexing and annotation of censorship materials. Important themes include how the advanced indexing tools match the users' performance criteria for these activities, and how they can foster increasing *collaboration* among experts and users of the censorship materials stored in the collaboratory through collaborative *accessibility* of a Collate collaboratory and its working environment.

The second part of the next evaluation phase will focus on subject retrieval and interactive annotation of censorship materials. Important themes include how the advanced search and annotation tools match the users' performance criteria, and how they can contribute to enhancing the *quality* and effectiveness of work by providing access to materials and knowledge that are otherwise not accessible.

Finally, the next phase of the empirical evaluation will focus on *acceptability* of a collaboratory in the film domain by the professionals. This theme will be addressed through interviews with users of real-life experiences of collaborative work with the tools of the collaboratory.

3 Introduction

Numerous valuable historic and cultural films and their sources are scattered in various national archives. Knowledge and usage of the multinational film material are severely impeded by access problems. Archive materials and reference system are difficult to use or not available in electronic form. There is a considerable lack of appropriate semantic search and retrieval aids that provide access to content information.

To fully exploit the cultural film heritage internationally, a high degree of cross-disciplinary collaboration among professionals working with the film media is required, since not only film materials, but also the film experts are geographically dispersed in archives and other institutions with related work.

The international work environment and the cross-disciplinary collaboration explains the many different perspectives and types of knowledge that are applied in the film media work. The different perspectives are formulated by professionals and end users with different tasks and expertise as well as by archivists, who are users of the collections, which they also restore, preserve, maintain, cataloge, search and mediate. These collections are large with heterogeneous multimedia and reference materials, and the staff is involved in many diverse internal and external tasks and events that mediate and research these materials.

In modern film archives work is very dynamic with many loosely coupled collaborative activities that demands control of a broad spectrum of initiatives. Many informal and non-institutional contacts exist between film archives, and specific professional communities exist, which , however, all lack technological support for their collaborative activities.

No single discipline, no single person and no single tool can offer sufficient expertise to satisfy the variety of information needs that this work domain addresses. This situation calls for a new computer supported collaborative and international work environment.

The present report provides a qualitative work analysis of the users' needs for the COLLATE multimedia collaboratory. The work analysis is based on field studies in the film archives involved in the COLLATE consortium: FAA, NFA and DIF. This work is the basis for the empirical evaluation of the interface design, user acceptability, accessibility and collaborative facilities of the prototypes of the COLLATE tool. While all work functions in the archives are covered in the present work analysis, the emphasis is on collaborative information seeking and collaborative cataloging, classification and indexing.

4 The COLLATE collaboratory

The COLLATE tool is supposed to foster collaboration through a distributed multimedia repository that provides Web-based tools and interfaces for collaborative work and content-based access to digital repositories for film archives, researchers and end-users.

The design and evaluation of a collaborative aid should ensure:

- Enhancement in the *quality* and effectiveness of work by providing access to materials and knowledge that are otherwise not accessible
- Increasing international *collaboration* among experts and users of the materials stored in the collaboratory
- *Knowledge acquisition* through professionals' analysis, evaluation, indexing, and annotation of film materials
- Collaborative *accessibility* of a content-centric, user-driven information system and working environment
- *Acceptability* of a collaboratory in the film domain by the professionals' through real-life experiences of collaborative work with the system.

The development of technologies and evaluation of the developed system in a real-life environment are closely intertwined. Outputs from both areas of project work strongly influence each other and, thereby, create an iterative, dynamic systems development process. Evaluation steps are explicitly included and the users themselves are actively involved throughout the various stages of development – be they administrators, archivists, film scholars, or interested end-users.

The prototype contains historic documentation of multimedia film censorship materials (texts, pictures, photos, posters, film fragments), employing digitised multi-format, multimedia documents on several thousand European films from the early 20th century.

Sources are provided by three major European film archives from Germany, Austria, and the Czech Republic, as well as by several collaborating national archives that make their special collections available for COLLATE.

All material is analysed, indexed, annotated, and interlinked by domain experts. The COLLATE system will provide them with appropriate task-based interfaces for cataloging, classification, indexing, and in-depth annotation with supporting knowledge management tools like thesauri and special keyword lists. End-users may also take active part in evaluating sources and adding valuable information through annotations. This way a growing body of intellectually indexed data and metadata is emerging over time.

The system will provide a platform for integrating the derived knowledge and, on this basis, offer advanced content-based retrieval facilities. Users are thus enabled to create and share valuable knowledge about the cultural, political, and social contexts of archive materials and this, in turn, allows other end-users to better access and interpret the historic film material.

Combining results from the intellectual and the automatic indexing procedures, elaborate content-based retrieval mechanisms can be accomplished. This combination of various so-far unexploited and unrelated knowledge sources helps users find what they are looking for. Thus, in addition to an increase in the size and richness of the digital repository, the COLLATE system will also lead to improvements in its quality, affordability, and acceptability.

The system exploits these data by employing advanced XML-based knowledge management and retrieval methods. The final version of the online collaboratory will integrate innovative document processing and management facilities, e.g., XML-based document handling, digital watermarking, and semi-automatic segmentation, categorisation and indexing of digitised materials.

It is important to notice, however, that the tools and interfaces to be developed in COLLATE will be generic to be easily adaptable to other content domains, types of applications, and categories of users.

The result of the COLLATE project is a prototype system intended to serve as a virtual knowledge and working environment for distributed user groups. It will support individual work and collaboration among

domain experts who are analysing, evaluating, indexing, and annotating film material. Particular emphasis is attached to supporting in-depth, interpretative analysis of the digitised sources.

Another result will be a comprehensive, digital multimedia collection on European historic films and film documentation, annotated and interpreted by a multi-national team of experts using the software system developed within COLLATE.

5 State of the art

This chapter briefly reviews relevant, state-of-the-art research contributions and development efforts within the areas of (1) collaborative information retrieval, (2) collaborative classification and (3) collaboratories and digital collections. The chapter is intended to provide a context for the subsequent analyses as well as inspiration regarding what facilities to include in the COLLATE collaboratory.

5.1 Collaborative information retrieval

A key motivation for the COLLATE collaboratory is a growing emphasis on – and recognition of – collaborative teamwork in today's work environment. Information retrieval in the film domain is no exception. The archivists in the archives frequently have to combine their efforts and competencies to find the information needed for their research and to answer requests from persons external to the archives. Currently, such collaboration is based on the archivists' personal knowledge of their colleagues' competencies and perspectives. This knowledge is, however, only acquired gradually, it is restricted to the people you get to work with, and it is only available through the person who possesses it. By emphasising the collaborative element of information retrieval the COLLATE collaboratory is intended to provide facilities for more effectively sharing knowledge about relevant information sources and for maintaining awareness of the progress of information retrieval tasks involving more than one person.

Traditionally, working in teams meant collocation, but recent innovation in communication and information technology now means that the workplace and work teams may be geographically distributed. This means that old ways of sharing information break down and new ways have to be established. Information sharing – and the entire flow of information – is essential to the success of teamwork. Indeed, research in computer support for cooperative work (CSCW) has addressed information transfer in collaborative situations such as formal meetings and unplanned interactions in order to design technology that can support such group interactions (Kraemer & King, 1988; Poltrock & Engelbeck, 1999). Similarly, collaborative filtering and recommender systems have been developed to allow users to share information with each other. Here, the behaviours of individuals in a group are used to filter out or to recommend items to other members of the group (Resnick & Varian, 1997). Recommender systems are already actively used in electronic commerce, recommending books, films, or restaurants to customers.

While previous research has investigated information transfer in collaborative settings, it has not focused on information seeking and rarely assumed that the process of information seeking was carried out collaboratively. In this sense Collaborative Information Retrieval (CIR) provides a new focus. CIR (Fidel et al., 2000; Hertzum & Pejtersen, 2000; Karamuftuoglu, 1998; Romano et al., 1999) focuses on situations where team members collaborate during various processes of information seeking and retrieval. CIR covers any activity that collectively resolves an information problem taken by members of a work team, regardless of the nature of the actual retrieval of information. This includes activities such as problem identification, analysis of information need, query formulation, retrieval interactions, evaluation and presentation of results, and applying results to resolve the information problem.

Manifestions of CIR

There are several ways in which team members may be engaged in CIR. A team may formally plan to seek information, allocating different search tasks to different people. Alternatively, teams may acquire information in an ad-hoc, unplanned way. Team discussions are a common means of identifying goals and the information needed to achieve them, but a single individual may be assigned to prepare an analysis of information requirements. The team may also discuss where information may be found, identifying other people who have critical experience or knowledge. Two or more people may work together to locate and extract information. Teams often work together to integrate the resulting information into an expanding knowledge of their shared problem domain and its solutions.

The earliest detection of CIR occurred in studies of engineers by Allen (1977) who uncovered the gatekeeper phenomenon. A gatekeeper takes the responsibility to look for information and to channel it to other team members who are engaged in solving work-related problems. This way, the recipient of

the information and the gatekeeper collaborate to find information that is useful to the work of the team. Later studies identified gatekeepers in other environments such as among office workers (Kidd, 1994) and among customers of electronic shopping (Ardissono & Goy, 1999).

A promising context for CIR is that of teams working on product development through Concurrent Engineering. Because of the complexity of new products and with the aim of reducing development time, as well as increasing quality and productivity, industry is turning to Concurrent Engineering, which brings together in a team all who are involved with a certain product, across disciplines and organisational hierarchy. The aim is to integrate and concurrently apply all necessary processes to produce a product that satisfies the customer's needs. Such a development process requires much cooperation and coordination and is, therefore, highly information intensive. Jassawalla and Sashittal (1999) identified various impediments to collaborative work in concurrent engineering. They found that teams that were successful in collaborating sought and gathered information collectively, while in teams that were not able to work collaboratively, the management tightly controlled information. Other impediments reported in their study, such as lack of a shared understanding of the problem the team is gathered to solve, are relevant for the success of CIR as well.

Another collaborative, information intensive process is the task of medical diagnosis and treatment planning. It involves players with various expertise, including physicians, residents, students, nurses, and laboratory technicians. Studies have shown that this is a complex social process in which information gathering is naturally distributed according to the status and area of expertise of each player (Cicourel, 1990). For example, students at times record a patient's history. While essential to the students' training, the information they collect is evaluated by an experienced resident or a physician before it is integrated into the team's knowledge and considered in decision making. Further, for this task all players use both formal and informal information from a multitude of areas in addition to medicine, such as hospital procedures, past experience in following the procedures, and stereotypes about types of patients (Forsythe, 1992).

Other studies in educational settings have identified CIR behaviour. Examining user interactions at terminals set in a university library, Twidale et al. (1997) observed that groups of students were working together on group-based problem solving tasks, even though, typically, the library was designed for individuals to work by themselves. These students performed either a joint search, gathering around a single terminal, or a coordinated search, working in adjacent terminals and discussing what they were doing. Such collaboration was also observed among high school students in a study of their Web searching behaviour (Fidel et al., 1999).

More than in any other environment, CIR is essential to the process of public policy making in a democratic society. For example, Tabor et al. (1998) demonstrate the importance of collaboratively collecting information in the area of natural resources management and planning. In addition to the various agencies, advocacy coalitions will try to participate in this process. The success of groups attempting to influence policy may be contingent on access to suitable information. Ecological and environmental policy making, by its very nature, requires data sets that are compiled by many agencies at the local, state, and federal levels. The need for information from such diverse sources necessitates interagency collaboration in information gathering.

5.2 Collaborative classification

An important focus of the COLLATE project is the development of methods and tools for content management and indexing. Because such tools will be embedded in a collaboratory context, this focus not only implies considerations of formal performance criteria for classifications, such as consistency, logic, comprehensiveness, and exclusivity. In a collaboratory context, performance criteria also involve pragmatic issues such as the users' work context and collaboration. Pragmatic performance criteria for instance address how classificatory tools support collaborative work, including knowledge sharing between the actors, and how the actors may actively contribute or do not contribute to the development of such tools.

COLLATE defines classification as the task of ordering the concepts in a particular universe of knowledge and making explicit the semantic relationships between the concepts. As invariant structures of the universe of knowledge, such conceptual relationships can be made explicit through a hierarchical/tree structure, facet structure, or a network structure. The result of the classificatory task can be a classification scheme, using symbolic notations to express concepts (examples include the

tree-structured Dewey Decimal Classification Schemes, and Ranganathan's faceted colon classification scheme). Alternatively, the result can be a thesaurus where the semantic relationships are made explicit in a network structure (examples include Art and Architecture thesaurus), and where the concepts are expressed in quasi-natural language (indexing terms).

COLLATE defines 'collaboratory classification' as:

- Collaboration on developing classification schemes and thesauri
- Classification schemes and thesauri applied as tools for supporting collaborative work

Collaboration on developing classification schemes and thesauri can take many forms. These range from collaboration in international and national standardisation committees on guidelines for classificatory tasks, or development of concrete schemes for libraries and archives (Miksa, 1999), to theory building within particular knowledge domains, such as biology (Theologus, 1969), and teamwork and more informal coordination of classificatory activities, for instance for document management in companies (Govindarej, Pejtersen & Carstensen, 1997). Thus, the agency of collaborative classification will vary from supporting the goal of international or national consensus-building on the order of knowledge, to making explicit the theories within a particular knowledge domain, and to supporting ease of access to information in particular collections or databases, or access to people's expertise.

Conversely, classification schemes and thesauri can support different forms of collaborative work. Standardised classification schemes for libraries and archives can for instance function as collaborative tools for data exchange. Furthermore, they can function as collaborative tools for intermediaries and users of an archive during information-seeking tasks (Albrechtsen & Jacob, 1998). Classification schemes (or taxonomies) created for theory-building can be applied as maps of knowledge, or boundary objects (Star & Griesemer, 1989) to inspire groups or teams of scientists working on related research problems. Finally, classification schemes that articulate people's expertise can function as coordination mechanisms (Schmidt & Simone, 1996) to link experts with one another within one institution or across institutions (Hertzum & Pejtersen, 2000). Through their support of collaborative work, it follows that classifications not only function as tools, but in addition perform some kind of *work* within particular communities, work contexts, domains etc. (see for instance, Pejtersen & Albrechtsen 2000).

Bowker & Star (1999, pp. 9-32 et passim) have recently taken a second look at collaborative classification from the point of view of what work classifications perform. Circumscribing their questions on the work that classifications do to fit the context of the COLLATE collaboratory, the following questions can be posed:

- *Who does the classification work*: How is the division of labour between, for instance, the designers and the users of a particular classification scheme? How large or small is the distance between designers and users, and what forms of user influence on classification work do we find? Do the users contribute to the design? Do some designers influence the classification schemes more than other designers?
- *What happens in cases where the classifications do not fit?* To what degree does a standardised classification forward the views of some groups, to the exclusion of other points of view?

Addressing the first question requires analytical as well as empirical evaluation of the origin, development, and uses of classifications applied in the collaboratory. What actors are involved in creating them, and are their intentions explicit? To which degree do the users participate in the design? The ways in which designers and users collaborate can range from contributions of annotations to schemes, submissions of suggested concepts and terminology to designers or metadata managers to direct involvement in creating the baseline invariant structure of schemes. What experience is gained from collaborative approaches applied in the collaboratory?

Addressing the second question involves empirical evaluation of the classifications applied and developed for the collaboratory, for instance through studies of users' interaction with the collaboratory. Furthermore, through interviews with users on whether their information needs are represented in the classification systems as they are displayed to them in the interface of the collaboratory, it can be assessed to what degree particular classification schemes include or exclude the needs of users. Finally, if a classification scheme fails to meet formal performance criteria such as logical structure and presentation, the user may experience 'breakdowns' (Winograd & Flores, 1986). Thus, analytic

evaluations of the classification should be done incrementally as possible 'breakdowns' are observed during empirical evaluation.

5.3 Collaboratories and digital collections

A collaboratory can be seen as a somewhat abstract notion of a system that enables collaboration among persons situated in different geographical locations by providing shared access to instruments, materials, and information in digital libraries. In order to understand the mechanisms of existing collaboratories we have analysed two currently functioning web-based collaboratories. The format and contents of these collaboratories are quite different and in this way they serve to exemplify some of the many different collaboratories that are currently appearing on the Web and on intranets in companies and organisations. Further information on collaboratories can be found in, for example, Finholt (2001). We have also included analyses of two museum websites. One of the museum websites provides entry points into a huge collection of art objects; the other provides opportunities to explore science topics in a web-facilitated way. Further information on museum websites can be found in, for example, Hertzum (1998) and Teather (1998).

BIOCORE

The BIOCORE collaboratory (www.ks.uiuc.edu/Research/biocore) is a collaborative research environment for molecular modelling and simulations and was developed by the Theoretical Biophysics Group at the Beckman Institute for Advanced Science and Technology, University of Illinois. For further information on BIOCORE, see Bhandarkar et al. (1999).

The purpose of the collaboratory is to enable researchers within the field of structural biology to visualise information, share resources, and interact with each other and with structural biology tools via a common infrastructure. The collaboratory is therefore supposed to reduce the difficulties of collaborating at a distance.

The collaboratory consists of four main elements, which can be selected from the main page of the collaboratory site. These elements allow the user to perform different activities within the system. One element is the *workbench* where users can apply diverse computational tools to work on specific problems or tasks. Another element is a *notebook* where the performed research activities are automatically recorded. The *conference element* allows users to hold, save, and reuse conferences with collaborators. Finally, the *document element* facilitates work on multi-author documents. Other interesting features of the collaboratory include provision of mutual awareness among the users by notifying users of the presence of collaborators at the site and facilities for controlling access to the personal data users store at the site.

Deciding to use the workbench there are three options. The user can: (1) Submit jobs, i.e. start and monitor computational jobs such as simulations of molecular dynamics on various computers. The user's colleagues are also able to access and monitor the job. (2) Run VMD, which is a tool for graphical visualisation. (3) Create, edit, and modify configuration files. Using the notebook the user is allowed to access the different events that has taken place in the collaboratory and also to exchange messages with other users on a one-to-one basis. Moreover there is a web-library and a conference facility, which presently provides a chat room for formal and informal discussions. The document facility is not yet available at the website. In order to support collaboration among the users of the site the control panel of the collaboratory provides instant messaging, notifications of events taking place in the collaboratory (e.g., starts of simulations, new notebook entries and people logging in and out). To make all these facilities possible the users must submit personal information about their projects and research affiliation. This is done by a login procedure where the user, on first entering the collaboratory, fills in a form and is presented to the rules and conventions of the collaboratory.

It seems that the collaboratory provides some effective facilities for its users. Focusing on the very specialised field of molecular biology the collaboratory directs itself almost exclusively to researchers and students within that particular field and leaves little opportunity for interested laypersons to retrieve information. Moreover the use of very domain specific terms makes it hard even for novices within the domain to fully understand the various features.

The Justice Web Collaboratory

The Justice Web Collaboratory (http://judgelink.org) is developed by Chicago-Kent College of Law and the National Center for State Courts. This collaboratory is about the judicial system and law of the USA.

The purpose of the collaboratory is to facilitate the collaboration between US judges and their support organisations by providing them with a common environment for knowledge sharing and interaction with peers. Another aim of the collaboratory is to influence decision-makers by drawing their attention to possible improvements of the overall judicial system and the day-to-day work of the judges themselves. The collaboratory is organised as a communication, publication, and education website and is based on advanced technology. An advisory board, consisting of 15 judges from different US courts, controls the website and makes up an American judges leadership roundtable. By that the quality and seriousness of the collaboratory is emphasised to its users.

The collaboratory consists of the following sections: (1) Information about the collaboratory and press releases. (2) Description of participation in the collaboratory, chat room and possibilities for participation in discussion groups and tutorials. (3) Descriptions of the partners in the advisory board. (4) Links to national and international judicial institutions. (5) Public accessible sites in the form of a resource centre from where information and judicial public access programmes can be retrieved. (6) Links to research within the judicial fields, domain specific web locators, and search engines. (7) Notes from the chair containing small written contributions on topics of current interest. Finally some important news, features of the collaboratory, and reflections on technology and the law are highlighted. Central events such as symposiums and conferences are displayed at the main page.

Within the public access area it is possible to search for judicial documents such as white papers, results of evaluation research, FAQs, procedural manuals etc. from a web-library. The material is accessible in hypertext or can be downloaded in its original format. The judges can apply yet another search function to seek information from their colleagues. By entering the peer support function the user receives an annotated list of persons interested in providing their assistance via mail. The entries on these experts are searchable by key topics and state/city code. Finally it is possible to search the entire public resource centre using keywords. In addition to the specific search areas where keywords are used to locate material, navigating within the collaboratory can be done by means of the many detailed menus. The collaboratory is restricted to the use of US judges and new candidates for participation in the collaboratory must make a written email request to apply for membership. Consequently some parts of the collaboratory requires password login. For the public-access elements of the collaboratory a user or guest password is required. When a user registers as a guest he is granted read-only access to the contents of the collaboratory whereas when registering as user it is possible to create a user profile and explore the collaboratory more thoroughly.

The collaboratory is of interest not only to its primary users, the American judges, but also to the public that searches for information about judicial topics and professional assistance. It is easy to understand the objectives of the various menu points but navigation is hampered by the rather deep hierarchical structure of the menus.

National Gallery of Arts

The National Gallery of Arts is a huge US collection illustrating major achievements in painting, sculpture, and graphic arts from the Middle Ages to the present. The museum website (http://www.nga.gov) provides a range of facilities targeting different needs and audiences.

The website is targeting virtual visitors, i.e. people who will visit the website only, as well as visitors of the physical museum. The former group needs sufficient online contents to make a visit to the website worthwhile in its own right; the latter group needs information for planning or following up upon a visit to the physical museum. In addition the website provides the gallery with a web presence that reflects the gallery's impressive collections and competencies in using various media in servicing its audiences.

The website is organised into nine sections: (1) planning a visit, (2) the collection, (3) exhibitions, (4) online tours, (5) education, (6) programs and events, (7) resources, (8) gallery shop, and (9) a kids forum. Whereas a few sections (e.g., planning a visit) are directed at either *physical* or *virtual* visitors most of the sections provide a blend of information about physical and virtual collections. For example, the exhibition section gives information on past, present, upcoming, and virtual exhibitions. Also, the website contains parts where the visitor is simply *selecting things for watching and reading* as well as

opportunities for being more actively involved. These opportunities for being more actively involved include on-loan educational materials, information about the possibilities of internships, the gallery shop, and the kids forum, which for example invites children to play hide and seek by looking for persons in selected pictures. There is *material specifically targeted* at teachers, kids, tourists who need a quick overview, and people with a research-oriented interest.

The two most extensive sections are the collection and the online tours. The section on the *collection* provides search facilities for obtaining data on all of the more than 100,000 objects in the National Gallery of Art's collection. Searches can be by artist, title, subject, provenance, and accession number. The available data cover full-screen versions of the works of art, bibliographies of the artists, conservation notes of the works of art, and various other pieces of information. The search facilities also provide possibilities for browsing excerpts of the collection by entering one of the online tours. The section on the *online tours* provides tours by medium and school (painting, sculpture, decorative arts, works on paper, and architecture) and in-depth study tours which explore an artist, a specific work of art, or a theme (e.g., Rembrandt or Edouard Manet's "The Railway" or still life). For example, the tour on Edouard Manet's "The Railway" discusses the creator, his influential depictions of modern life, and the context of the painting in relation to the rapidly changing city of Paris of the late-nineteenth century.

The Exploratorium

The Exploratorium is a US museum of science, art, and human perception. The museum website (http://www.exploratorium.edu) provides a range of online facilities for exploring these issues.

The Exploratorium's mission is to create a culture of learning through innovative environments, programs, and tools that help people to nurture their curiosity about the world around them. In so doing they have taken an active role in the movement to promote museums as educational centres. Education is seen both as schooling where teachers instruct pupils and as an individual activity where a person explores an issue on his/her own. The focus on innovation and opportunities for nurturing curiosity has also led the Exploratorium to explore the possibilities of providing educational activities online. The website focuses on the online contents whereas information about the physical museum is relegated to a subsection outside the prime focus of attention.

The website is organised into a number of sections: (1) the Hubble Space Telescope, which gives web-access to dynamically updated pictures of the sky, (2) the Panama Pacific International Exposition in 1915, which provides a 3-D re-enacting of the exposition celebrating the opening of the Panama Canal, (3) video webcasts of purpose-made programs on science issues, (4) an invitation to the Exploratorium's 24th Annual Awards Dinner, (5) the revealing bodies section, which examines how imagery has changed the way we look at our bodies, (6) the learning studio, which provides material for self study or for supplementing classroom teaching, for example an image-illustrated dissection of a cow's eye, (7) the observatory, which provides a guide to a range of astronomy resources, and (9) the sport science section, which explores science issues in the context of various popular sports, for example using skateboarding as a vehicle for learning about the principles of momentum, gravity, and friction. The sections do not provide a tightly knit unit, rather on the contrary. Also, the sections (especially the Hubble Space Telescope and the observatory) provide lots of links to other websites not developed or controlled by the Exploratorium. This way the Exploratorium website weaves itself into the World Wide Web and chooses to focus on the resources available to visitors rather than on establishing the Exploratorium as a self-contained entity.

A wide range of operations is used in implementing the procedures available on the Exploratorium website. These include facilities for viewing material in various formats (text, images, audio, and video), for getting additional information (suggestions to teachers, things to try out, links to other websites, help, etc.). Some of the live webcasts have the additional function of building some kind of community around the website by having people meet in front of a computer to, for example, watch a total solar eclipse as it happens. Here, people can combine what they can see out of their windows with images from telescopes and from different geographic areas. However, whereas the website is very rich in contents it has few facilities for enabling the visitors to express themselves.

6 Methods of work analysis

Generally speaking, approaches for studying collaborative work are concerned with designing technologies that support, facilitate, and enhance daily work practices. Web models (e.g., Kling & Scacchi, 1982) were an early approach directed at establishing requirements for information systems. Recent frameworks include Bucciarelli (1987), Ehn (1989), Jones (1995), and Ford and Wood (1996). Poltrock and Grudin (1999) identify communication, information sharing, and coordination as fundamental social activities engaged in by teams and organisations, and they identify specific technologies that support these activities, either in real time or asynchronously. Although a specific activity or technology may span these categories, these distinctions have served as a useful assessment tool and have guided design and implementation. Methods for work analysis must span communication, information sharing, and coordination in order to encounter the complex challenges that must be met by information technologies intended to support collaborative work. We will be using the Cognitive Systems Engineering (CSE) framework for work-centred evaluation and design developed at the Risoe National Laboratory (Pejtersen et al., 1997; Rasmussen et al., 1994).

6.1 Cognitive work analysis

For dynamic and collaborative work, such as work in archives, stable work procedures are not the norm. Most of the time, tasks are discretionary and explicit consideration of goals and constraints is necessary. Great diversity in behavioural patterns is found among the collaborating actors of an organisation. No two individuals are occupied in the same way and at the same time by the same activity; nor will a task be performed in exactly the same way twice. The variety of options with respect to what to do when and how' in dynamic work is immense. In order to understand why a particular piece of behaviour is chosen we have to understand the action possibilities in a particular situation, and how a particular action is chosen. In other words, we have to identify the *constraints* which guide the choices taken by the actors together with the *subjective performance criteria* which are applied by the actors to choose among potential action possibilities.

The object of work analysis in dynamic, collaborative work is not only the "task", It includes all the features of the work environment and the interpretation of these features by the actors, all of which in collaboration create the task ad hoc. The objects of work analysis are (1) the constraints and possibilities intrinsic in the work domain and (2) the competence, performance criteria and subjective preferences of the individual and collaborating actors. Several different perspectives of analysis are necessary to bridge from a description of work domain characteristics to a description of actors' characteristics, see figure 6.1. These perspectives include the means ends relationships of the work domain and their relationship with the work organisation, the task situation, the cognitive decisions, the mental strategies and the actors' knowledge, expertise and demographic characteristics. These perspectives serve to identify the information needs of the actors, who are in control of the work.

The CSE framework for work analysis is based on generalisations from field studies which led to the design of information systems for a variety of modern work domains such as process plants, manufacturing, hospitals, and libraries.

Previous work

Risoe's long term research program on information seeking and classification contributed to the development of the cognitive work analysis method and can feed into the Collate project. Examples are the new philosophies adopted for development of ecological classification schemes, the implementation of mental search strategies in the search dialogue, the experimental work with ecological, visual interfaces, and the real life evaluation of a search and - classification system at different work places.

In order for classification schemes to be successful in a subjective and complex knowledge domain, they have to be based on users' requests and information needs as they are expressed during collaborative real life searches. Comprehensive field studies of the communication about fiction during five hundred user-librarian negotiations have been analysed in order to study the above mentioned issues. A unique classification scheme has been developed based on users' formulations of their value criteria and needs during decision making in cooperation with librarians. Based on this analysis a facetted classification scheme was developed and used for analysis and representation of fiction (and

later fact) documents in the Book House system for information retrieval and classification (Pejtersen, 1994). As shown in chapter 8, the facets of this classification scheme can also be applied to structure the levels that are applied in the scheme for film classification and annotation that has been developed by NFA in its work on filmography. A similar analysis of the communication content of users' email requests to films at DIF has been carried out. This analysis is described in chapter 9 dealing with the DIF archive, and the resulting model has many features in common with the attributes/facets found in the fiction domain (Pejtersen, 1980).

Another main effort was dedicated to the analysis of the different mental search - and mediation strategies applied during information seeking by librarians and users depending on their experience with a particular information problem (Pejtersen, 1979). So far, the study of archives have made it possible to identify similar strategies during the archivists' work as described in chapter 7 and 8.

Means ends perspective of work

A representation of work should identify the entire means-ends relationships within the work domain chosen for system design. The means-ends representation is structured in several levels of abstraction.

The lowest level represents the physical objects that are involved in work. The next level describes the physical work processes in which the various physical object are involved (people, tools, etc.). Work functions are represented by more general concepts without reference to the physical work processes or objects that constitute a function. The fourth level presents the priorities that are used to coordinate resource allocation to the various general work functions. The highest level of abstraction contains the goals and constraints. The priorities are used to compare the results of the work functions with the goals and constraints formulated at the top level.

Each of the perspectives described below (illustrated in Figure 6.1) are analysed according to the five means ends abstraction levels: goals and constraints, priorities, general functions, work process, and physical resources. The analysis is both descriptive and prescriptive in nature because its purpose is not only to understand how the current work is and why, but also to go beyond current work practice and imagine how it could be done differently.

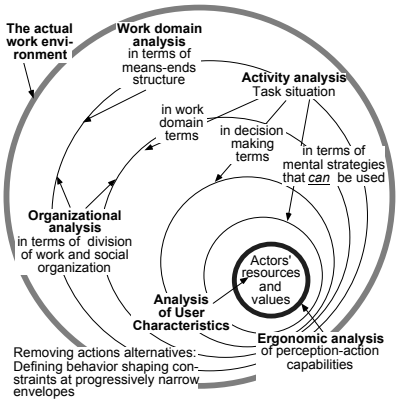

Figure 6.1: The different perspectives involved in work analysis.

Work organisation perspective

The work organisation determines the form of communication, i.e., whether the coordination depends on orders from an individual actor, on consensus in a group decision making, or on negotiation among the actors involved. Communication of social values, subjective criteria, and intentions are necessary in the particular work setting for decision activities, coordination of activities, for resolution of ambiguities, and for recovery from misinterpretation of messages.

The work domain is under the control of a set of cooperating actors, and allocation of roles can refer to sub-spaces of the means ends relationships of the work domain or roles in decision functions. This

allocation of roles to actors depends on ever-changing circumstances and is governed by criteria such as actor competency, their access to information, the need for communication on coordination, sharing of work load,complying with regulations e.g., Union agreements and so forth.

Task situation perspective

Task situations are a set of problems to solve within reasonably well defined boundaries. For each task situation, the relevant subset of the means-ends relations are identified. The identification of the subset of *functional* constraints, which are relevant in a particular situation, is rather straightforward. This is not the case for the *intentional* constraints. In dynamic work many action possibilities are found and institutional intentional constraints propagating top-down will be dressed-up by local, situation- and person dependent criteria. Therefore, identification by an actor of the local, intentional constraints depends on the ability of the actor to identify the state of affairs of cooperating actors' tasks, and their actual intentions. In many cases, actors judge the intentions of cooperators through non-verbal channels or establish, if necessary, informal communication channels for that purpose. Getting a handle on this intentional communication is a key problem for design of computer support of cooperative work.

Decision task perspective

It is necessary to get a description of the decisions that are made in the task situations under study. This serves to determine the information requirements of a task. Decision-making is more manageable when decomposed into subroutines and states of knowledge about different features of a task. This is useful for linking different processes, for bringing results from previously successful subroutines into use in new situations and, for communicating with cooperators in decision making. This is important since a complex decision task may be shared by a number of cooperating team members.

This perspective of analysis as well as the following perspective of mental strategies are focused on *information aspects and* needs. The basic categories of decision functions to be considered for a more focused identification of functional and intentional constraints include information retrieval, situation analysis, priority judgement and goal evaluation, planning, execution, comparison and monitoring. These decision functions involve basically different information needs.

Mental strategy perspective

This perspective provides a description of the mental strategies, which can be used and are likely to be chosen by actors in a particular decision situation. A 'mental strategy' is an abstraction describing one consistent reasoning approach characterised by a certain kind of mental representation of means ends relationships, and a particular interpretation of observations. A strategy will influence an actor's situational interpretation of the functional and intentional constraints found in the work domain. The choice of strategy depends on the competence and performance criteria of the individual actor. The strategies and the perspective taken by actors will change dynamically during a decision task. One reason to shift between strategies is their very different resource requirements with respect to time taken, type of mental model available, number of observations necessary, and so forth. Shift in strategy is a very effective way to circumvent local difficulties along the path of work. An important implication of this is that an information system should support all the strategies relevant for a task to allow users to shed mental workload by shifts among strategies. Forcing users to work through problems using only one strategy, preferred by the designer, rather than bypass problems by selecting another strategy will strongly influence users’ acceptance of a system.

Actors' knowledge perspective

This perspective serves to uncover the varied demographic features, education, experiences, competence, and cognitive resources of the individual and collaborating actors. In addition, their level of expertise and subjective performance criteria should be uncovered. Performance criteria reflect both those imposed by the work itself, the individual preferences as well as those agreed upon during collaboration, for example in selforganising teams.

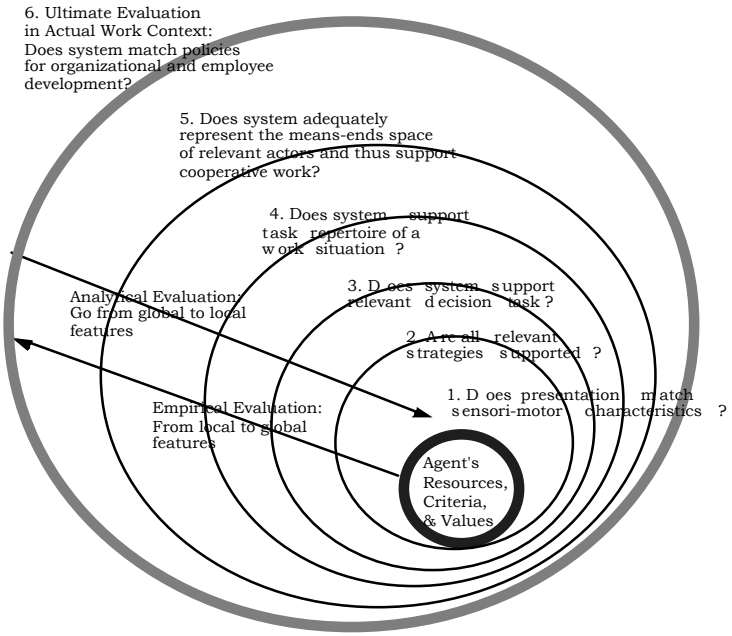

Figure 6.2: Framework for system evaluation.

The framework for system evaluation

'The CSE framework for system evaluation (Figure 6.2) was developed as a general approach to evaluation of a system's support of the complex interaction identified in field studies between:

1. the activities and organisational relationships and constraints of work domains.
2. actors' cognitive, social and collaborative activities and their subjective preferences in collaborative and individual work.

The framework for system evaluation answers questions such as these: Does the presentation of information match actors' characteristics? Are all relevant strategies supported? Does the system support the actors in decision making? Does the system support all the tasks that work-team members perform? Does the system support the cooperation and coordination necessary?

The answers to these questions are based on an analysis of the degree to which the possibilities and constraints identified during the initial work analysis can be explored and supported during the use of the system. The framework boundaries of system evaluation "move" the context successively further away from the actor to encompass more and more of the total work content. The evaluation can take place through data collection either in a laboratory or in a real work situation-or both.

This approach was applied in the evaluation and design of the Book House system for information retrieval and classification. A large number of laboratory experiments were performed including prototyping, thinking aloud, word and picture association tests of visual displays with different kinds of thesauri, classification schemes etc. Similarly, a large part of the evaluation took place as field tests of new indexing and search strategies, compatible databases with documents from different knowledge domains, and participatory design at the work place.(Pejtersen, 1989).

A similar approach will be applied in the evaluation and redesign of the different future versions of a Collate collaboratory for archivists.

6.2 Ecological information system design

Related to the CSE framework are principles for coupling the work analysis to design of ecological information systems. This implies that support of work is more effectively given by the creation of an information environment which makes visible the "ecology of work" and enables direct perception of the repertoire of action possibilities from which actors can make a choice. The ecology of work is found through a work analysis. Professionals are not merely subject to 'information input' from a work

environment, which has to be analysed. They are also asking very specific questions to the environment, based on their perception of the context. They are, in a Gibsonian sense (Gibson, 1966), able to consult 'invariants' in the work environment by direct perception, provided the environment is well structured and transparent. In this way, performance in a familiar environment can be represented by an invariant hierarchy, based on the human ability to read off information at several levels of abstraction in the means-ends representation. In an ecological interface, an attempt is made to support a user's direct perception of the level in the means-ends structure that is most appropriate to the needs and, at the same time, to support the level of cognitive control at which the user chooses to perform. This choice between skill-based, rule-based and knowledge-based behavior will among other factors depend on the actor's familiarity with a given task situation. Ecological system design requires a deep understanding of the work to be supported, and applying the framework for cognitive work analysis will provide this understanding.

6.3 Empirical study methods

This section describes the methods applied in our analysis of the work in the three film archives. The description covers the research design, the data collection procedures, the data recording procedures, the data analysis procedures, and the validity of the analysis.

Research design

The present study follows a qualitative empirical research paradigm. This implies that the design of the study is flexible in order to accommodate the inclusion of new research topics and foci during the analysis. Likewise, the research design is open-ended in order to encourage feedback and other contributions to the research by the informants of the study. The overall research questions as formulated for the participants of the study are as follows:

1. What are the services of the archives: what kind of collections and products do the archives offer? Who are the users of these services, and what kinds of needs do the users express?
2. What kinds of tools/information systems do the archives apply for their services: databases, manual files, spreadsheets, e-mail, Internet tools?
3. What kinds of collaboration among staff take place within the archives, and with outside parties, like institutions and individual persons, and for what kinds of tasks? How are the services planned and coordinated in the long term as well as on a day-to-day basis? In what kinds of professional networks does the staff participate?
4. What are the overall goals and strategies of the archives, and how are the organisations structured? How is the relation between staff and managers? How is the division of labour and delegation of tasks decided? What kinds of competencies and skills does the staff have, and how does staff share expertise, ideas and work tasks with one another?
5. What kinds of future developments does the staff of the archives envision? For instance, visions of digitised archives, information technology, collaboratories, user services, new professional roles?

These research questions were addressed through field studies in the archives, followed by qualitative data analysis and discussion with the informants about assumptions and preliminary results.

The qualitative approaches to data analyses are means-ends analysis of institutions and actors as well as analysis of collaboration and task situations, with particular emphasis on the task situations of information seeking and cataloging/classification. Following the framework for work domain analysis, the primary units of analysis for all the perspectives are:

- Goals/constraints
- Priorities
- Functions
- Processes
- Physical objects

All these units of analysis have been addressed in the data analysis.

Data Collection procedures

Data was collected through field studies, supplemented with ongoing contact with the archives. For instance, data on user requests were provided by DIF after the field study at DIF had taken place. Further data sources are work tools applied by the archives. These sources include the archives' web sites, their database formats and cataloging rules, and products like filmographies.

Field studies were carried out in the following phases:

1. DIF (15-16 January 2001). This field study involved three members of the Risø staff.
2. FAA (20-23 March 2001). This field study involved three members of the Risø staff.
3. NFA (30 March - 6 April 2001). This field study involved four members of the Risø staff.

The field studies applied the following techniques for data collection:

Semi-structured focus group interviews, where staff representing a broad spectrum of functions were gathered to share and discuss a number of themes, corresponding to the research questions.

- Semi-structured interviews with individual staff, exploring professional background, prototypical task situations, and forms of collaboration.
- Artefact-based interviews, discussing staff's use of the tools for a prototypical task and possible 'breakdowns' during the application of the tools.
- Participant observation of prototypical tasks, for instance information mediation in user services.

Data recording procedures

The focus group and interview data collected during the field studies were recorded on tape and subsequently transcribed. Videos and photos have been used for recording the layout and organisation of the work places. The raw data from this study are confidential, and the identity of the individual informants is not revealed in this report.

Data analysis procedures

Data analysis has been done iteratively and to a considerable extent simultaneously with data collection. Furthermore, the data analysis has involved staff at the archives. In this way, interpretations, assumptions, and conclusions have developed incrementally, as the field studies were carried out.

For the collaborative information-seeking task, three data analysis methods have been applied: (1) Analysis of transcribed field data from interviews and email requists. (2) introspective method for analysing expert knowledge and (3) categorical analysis of user requests for information seeking (for DIF and FAA). A member of the Risø staff did the analysis of DIF's user requests, whereas a member of FAA's staff carried out the analysis of FAA's user requests.

For the cataloging/classification task at FAA and NFA, the applied method of data analysis is decision task analysis. This approach was extended with analyses of the products of the cataloging work (the filmography at NFA and formats and example output from databases at DIF).

Verification and validity

Continual feedback and discussion of preliminary assumptions and results with informants in the archives have been important in order to ensure the validity of the analysis and conclusions. Each archive has commented on a draft version of the present report. This feedback has been highly important, not only for verification of the collected data and ensuring the validity of the data analysis, but also for providing additional information and, thereby, making the analysis more comprehensive and coherent. Furthermore, the issue of validity has been approached through minimising the distance between informants and evaluators. Thus, staff at DIF has been involved in task analysis of information seeking and has communicated with Risø staff on data analysis of user requests. Furthermore, a staff member at FAA has contributed with collection, data analysis, and reporting of user requests for FAA.

7 Work in FAA archive

The Filmarchiv Austria (FAA) is located in Vienna and Laxenburg and is the centre for all moving image documents in Austria. The archive is funded by the Austrian government and is a non-profit organisation. The archive has about 20 employees and is divided into the following departments: administration, film archive, documentation (text documents, photos, filmography etc.), information systems, communication, services and mediation. The collections have been developed since 1955 and consist of films, clippings, microfilms, film magazines, stills, negatives, film programs, posters, newsreels and books. FAA is a member of FIAF and participates in international projects.

7.1 The work domain

Goals	Contribute to the preservation and mediation of national and international cultural film heritage, contribute to national and international research on films.
Constraints	The budgets and the management's planning of the archive's activities, copyright/legislation, the non-existence of a comprehensive central register for locating external materials, acquisition criteria, staff's domain knowledge, personal network and internal training, the physical space, opening hours and number of staff at the archive.
Priorities	Visibility and uniqueness of services and collections, reduction of complexity through creating better information systems, research, diversity of services and topics, efficiency in finding information and locating materials.
Functions	User services, information seeking, including location of "assumed-to-exist-somewhere" materials, create retrospectives, external collaboration with institutions and persons, document national research through collection building, colloquia and retrospectives, document national film production, maintain and develop locality, personal contacts etc., participate in EU-projects.
Work Processes	Order copies of films, communicate with journalists, distributors etc., check copies, schedule program, create cataloges, create posters, participate at opening nights of retrospectives, follow up on feedback, do statistics on spectators, give speeches in collaborating institutions, write articles, speeches, and user sheets, talk to users to specify most precise search possible given limitations of search resources available, search database, input information into database based on watching/analysing films, newsreels and documentary materials, write academic reports, speak and listen to end users, customers and external contacts, to colleagues at the archive and from other organisations at weekly technical meeting and at conferences, scan documents, edit materials, analyse and extract from newsreels/documentaries, talk with users on the telephone, write faxes and mails to customers.
Physical Objects	Staff spaces, users' work space, reading room, collections, films, photos, posters, videos, newsreels, Sammlung Leutner, users (different categories), spectators to retrospectives, library, filmography, contracts, user request form, silent films, board of institution, manager, The National library and other libraries in Vienna, sound archive and theatre plays, University of Vienna and other university institutions, production companies, broadcasting companies, Institute of Modern History, The Berlin Film Museum (Deutsche Kinematek), private collections, commercial collections, The Bundes Archive in Berlin, state archives and political archives, DIF, archives in Italy and Hungary, FIAF, journalists/newspapers, BFI, Canal Plus, CDs with newsreel soundtracks, computers, databases, word-processing, film editing technology, Internet, e-mail, editing desks, telephone, fax, books.

Figure 7.1: Means-ends abstraction hierarchy

7.1.1 Main goals and strategies

The overall goals comprise preservation and mediation of national cultural heritage. FAA does not function as a de facto national archive and does not operate according to national legislation and policy. There is no obligation to deliver copies of books or films to the archive. The archive has status as a non-governmental organisation but receives a large part of its funding from the government and is dependent on these resources. The overall goals are to:

- Contribute to the collection and mediation of national and international cultural film heritage
- Contribute to national and international research on films
- Establish a position as the foremost authority on Austrian film
- Provide public services. Create an attractive work environment for researchers. Attract the general public for low-fee or free information services.

One of the primary goals within the archive is to maintain and manage its collection of films, film stills, photographs, posters, film programmes, booklets and other film-related paraphernalia. The size of this collection, the diversity of materials and the range of services that FAA endeavours to provide make the archive work very complex. It is helpful, when looking at information retrieval and cataloging tasks, to break the archive down into means ends components as described in figure 6.1

The organisation has various strategies for reaching the overall goals. Institutional strategies are defined in the management board's negotiations. These strategies are communicated to staff, more or less as milestones, with about 3 items per year. They are not negotiated with staff.

In line with FAA's efforts to make itself an open and accessible institution, the imperative to collaborate is one strategy that pervades the whole organisation. At one level collaboration can be seen as a method for dissemination; through its external collaborations FAA is able to establish and maintain a reputation for itself. Collaboration also provides more direct forms of added value, from user feedback through to obtaining resources from European Union projects.

7.1.2 Constraints

There is no legislation saying what the archive has to do. It has no legal status and no obligation exists to control the work, it is a non-profit and non-governmental organisation. The staff in the archive can and do develop services and collections according to users' needs. Since there are no constraints from government, there are no work-related delays caused by the need to obtain government approval.

The director makes an annual report together with a budget, which has to be accepted by the government. The budget supports the functions of preservation, restoration and exhibitions. There seems to be quite a lot of focus on the commercial earning power of the archive including the sponsorship agreements and a general understanding amongst the staff of the dependency on the financial contributions that these earnings make to the budget of the entire archive. Consequently, archive staff accept that resources must be shared between the commercial and the non-commercial parts of the archive.

Limited financial resources are a constraint on all the work in the archive. It determines how many staff members can be employed. It is too expensive to buy the new technologies that are introduced on the market. The commercial Austrian Newsreel production needs investments in new tools. The archive sometimes out-sources work on the production of soundtracks to accompany the archive's video productions.

Commercial work is constrained by the audience's preferences and the broadcasting companies. Focus has to be on themes and products that are profitable.

Timetables and deadlines limit and define the work and the collaboration among the staff that undertake different and similar work functions.

The work is constrained by limitation of databases, which only allow searches across very narrow fields. Since the internal loaning system is not rigorously adhered to, it is sometimes difficult to locate materials. Dealing with unpredictable and difficult user requests is constrained by lack of film content

information in databases. The databases are not ideal for automated processes of information management and cataloging.

End users are constrained by the library's status as a reference library. Users cannot take materials away from the library to work; either at home or in their normal work place.

Materials are donated, purchased or copied. Copies of films and photos are subjected to payment of royalties (copyright). Materials are also collected from other institutions. In the case of FIAF institutions, there is a low fee or no-fee agreement on local copies that can be stored and made available in FAA. British Film Institute and German Film archive in Berlin are important sources to incorporating new material. The conditions for requesting outside materials are:

- Upon receiving requests from users/customers
- When developing current awareness of the market (magazines, fairs, festivals etc.) that is conducted by FAA staff or communicated to FAA staff from outside by collaboration partners
- When planning events like retrospectives and festivals

7.1.3 Priorities

The management board strategies seem to revolve around priority criteria related to the input of money, the output of various services and academic and commercial products. The quality of the services and products are measured, for example, by the number of spectators at retrospectives and income from sales of videos and newsreels.

Priorities are also found among key members of staff; providing the best user services possible, furthering film research, collection building and growth, preservation, restoration of collection, and commercial success all have a high priority among staff members. Every staff member contributes, to a varied degree, to user services and the service depends on specific domain knowledge, experience with materials and the skills of each staff member. They share the priority of providing an expeditious service for the customers, e.g. responding to a user request on the same day on which it is posed to the department. This happens by either by giving the answer right away when it is a simple question, or by explaining when the answer will be given when more complex searches have to be performed. It is important for the archive to show that it cares about the customer.

For the library and for other staff members, working “part time” with user services, the highest priority is to provide and develop the best user service possible and to refine reliable information sources. This means continually improving the database and establishing links with colleagues in and out of the archive who will be able to provide information or advice about where to look for information. Today the department demands a fee for information or material that is provided to customers but they allow special negotiable prices as a service to, for instance, small TV-stations, young artists or clients that need a specific picture for a birthday etc. There are some fixed prices but in other cases they depend on the use situation and the circumstances of the customer.

The academic research publications and talks have varied priorities. Staff that undertake preservation and production activities attach importance to the creation of high quality academic work and to the work that allows this material to be seen and appreciated by others. It is also important that they are able to make high quality videos that can achieve a respectable level of commercial success in Austria and internationally. Getting credit for the service provided to, for instance, a TV-station is of great significance. The customer must mention the name of the archive when using a picture or a film clipping.

The most important criteria for collection of materials is to acquire material that will support the users’ needs, rather than opting for a comprehensive retrospective collection.

This goal, related to the priority of high quality services and products, is measured by the number of end users, spectators and customers, the amount of income, and by visibility in academic research.

Given the constraints and priorities a tight cross-disciplinary collaboration takes place among departments and staff. Effective cooperation and knowledge sharing with colleagues has a high priority and is necessary to reach the goals.

7.1.4 Work functions

The aim of the analysis of work functions at FAA is to understand the way in which goals, constraints and priorities are executed in different functions, and how they relate to the different functions. It is also necessary to understand how these functions are interrelated. The analysis of work functions at FAA breaks down different activities into functional units. Although these do not always directly match actual departments in the archive they are broadly reflective of the different areas of work that are undertaken.

7.1.4.1 Information seeking

Aims

A primary task is to provide users with access to the collection of books, journals, and magazines managed within the archive. Users are the general public and professional users as well as archivists working at FAA. Thus the archivists both perform as users of the materials of the archive and as professionals, who help with searching information for the people, who ask for assistance.

The most pressing strategic issue in the library relates to user-services and identifying methods to enhance the users' experience of the library. Although this is clearly a question of providing a good service there is another philosophy that underlies the efforts made on the behalf of users. The point here is that staff at FAA consider users as a resource, not in financial terms but in the sense that their input enables the library to develop and improve. From a strategic point of view this philosophy entails that attention is paid to the input users provide and consideration is given to ways in which the quality of user input could be enhanced.

Given the value attached to user input it is natural that FAA would like to attract new users to the archive. One strategy here is reflected in the physical appearance of the library. Aside from being comfortable and quiet, the library contains a permanent exhibition of historical artefacts related to the film making process. They conduct guided tours with groups of students from various faculties informing them about the work and presenting the documentation stock.

Providing new users with an experience that makes them want to return is one thing, attracting new users in the first place is another. In this regard it is less productive to think of the library in isolation since it seeks to exploit other activities undertaken at FAA. When films are shown at the archive during the summer, for example, this is seen as an effective way of attracting people interested in film who might otherwise have been unaware of the services being provided by FAA. The need to actively recruit new users is partly a result of the fact that there is no education in Austria that focuses exclusively on the study of film and cinema. There are, though, other courses that skirt around the area and efforts are made at FAA to follow the reading lists of courses that might provide potential users and purchase books that appear as if they might be important or popular.

Information retrieval

The library gets many requests from other archives and institutions, either forwarded or sent out as list mails. This involves responding to user requests and finding material appropriate to their needs. Information is extracted from users to undertake a search on their behalf. Library staff must ensure that the user request is as specific as possible. Once the request is specified it is the task of staff to search the relevant sources in which information content of the library is managed. In working with the user to specify a search request, library staff draw on their personal knowledge of the film domain and their knowledge of what is available in the collection. They also draw on their knowledge of what types of search are possible within the constraints of the information systems currently available to them. Personal familiarity and domain expertise entails that there is less work to do in the specification of an information request.

The information specialists also function as consultants. Some requests require an intermediary to contact colleagues at other institutions. If an institution/person does not lend their material, the intermediary refers the user to the site or individual in question. In some cases, the institutions do lend their materials to FAA, but the user will have to screen or read the material at FAA.

Although users are allowed to browse through the books displayed in the library, it is usually not possible for them to conduct searches via the library's electronic databases or to physically explore the archive's vaults.

When it is not possible to answer a user request on the basis of FAA's information content, the staff ensure that they are able to point the user towards a source where s/he is likely to obtain the information.

Allied to the information retrieval tasks conducted for the benefit of specific users, library staff are also involved in information retrieval work that aims to enhance the quality of service they provide. One aspect of this is cataloging and classifying information content and acquiring the information necessary to perform these tasks.

It is also important for the library to keep abreast of developments in the fields of film history and film theory so that they are always aware of relevant publications that are becoming available.

For reasons of circumstance and convention all of FAA's contact with national and international media is also managed within the library. Although there are well-established contacts between the media and the archive there may be occasion when it is necessary to investigate which forums would be most appropriate for the information that is being provided.

The library exchanges books with international libraries through lists of books, but there is no inter-lending procedure.

Information needs

The most pressing information need in the library relates to its own content. In order to provide users with quick and reliable information it is obviously important that FAA staff can quickly access relevant materials. Aside from providing a basis for user services, knowledge of information content is also important for the management and maintenance of the FAA library. More than knowing where a book or article is held it is necessary to know the condition of the original copy and, in relation to new materials, what criteria are most important in the cataloging and classification process. It is also important for library staff to know, given that FAA is not able to meet the demand, where a user might look elsewhere for the information they require.

The national filmography is a bibliographic facility only and does not provide information about where the films are available, and in what versions and conditions. A lot of time and effort is spent localising films in other places such as archives, museums, private persons, stores, distributors, etc. This is especially the case when devising retrospectives, but also applies for film restoration and product development.

Information sources and tools

The majority of the written materials held by the archive can be accessed via an electronic database. Unfortunately this database only allows searches along quite limited lines. As a result it is important that library staff are able to collaborate with the user to ensure the information request is, in relation to the constraints imposed by the database, as specific as possible. At the same time staff at FAA are very adept at using each other as sources of information. So while it might not always be straightforward for one person to establish exactly what a user requires someone else, with a different area of expertise, can be called upon to assist in this process. The need to work closely with users is reflected in the fact that staff at FAA look upon them as a source of information. In the most famous instance of this a private collector of film memorabilia ultimately donated his vast and valuable collection to the archive.

It is also the case that user requests serve to show library staff what general areas are of interest and, given this, what subjects could be more thoroughly covered in the library collection. As all users are required to fill in a form in relation to each request they make FAA is able to follow general trends in user preferences. Through FAA's participation in FIAF and through the personal initiative of FAA staff, there are extensive links with the international film archive community and related institutions both inside and outside of Austria.

7.1.4.2 Cataloging

Cataloging at FAA is directed to a number of different media, including books, journals, stills and newsreels. FAA has developed a number of local standards for cataloging, including subject analysis, indexing and document description. The media applied for cataloging are stand-alone database systems and card catalogs. Cataloging thus also involves maintenance of single databases and card catalogs. Coordination of maintenance is done informally between catalogers across functions. There is currently little coordination of standards for cataloging. For subject indexing, in particular, the cataloging staff at FAA expressed the need for a higher degree of coordination and standardisation of approaches, including a higher degree of compliance between indexing vocabularies in order to support subject retrieval across individual databases. It should be mentioned that one of the cataloging experts at FAA shares her expertise with catalogers outside FAA. Through her additional expertise she functions as lecturer in cataloging for other film archivists. The cataloging experts at FAA mentioned a need for more formal and frequent coordination, through for instance, internal meetings on cataloging approaches and standards.

7.1.4.3 Preservation and restoration

Aims

A variety of preservation and restoration work at FAA can be described as technical activities. This reflects the fact that the materials the archive holds are diverse, of variable condition and often difficult, without specialist tools, to work with. Depending on the task, however, information requirements in this work concern more than knowledge of how to operate technical equipment.

The strategies in technical activities will, to some extent, be determined by criteria external to the archive. This points to the fact that techniques in film restoration are international and, as such, so too are the majority of quality assessment criteria. Furthermore, the tasks involved in technical work are, from the point of view of strategic decision-making, not always best approached in isolation.

With the work done on FAA's videos, for example, the person doing the technical work will, since they must decide which clips are suitable, also be involved in making editorial decisions. In this light, holding weekly meetings with technical staff and management appears to be a pragmatic strategy for ensuring that activities and objectives are coordinated.

The relationship with management is also important in relation to the decisions that are made regarding investment in new equipment. Although technological developments in the field occur from month to month it is obviously not possible for FAA to invest in every new work tool that becomes available. Indeed, given that the technology in this field is extremely expensive any new investment must be considered long and hard.

Prior to approaching management with a request for new technology technical staff try and prepare a case that demonstrates how a new machine could impact on work tasks and why investing in such a device cannot be delayed any longer.

When making an approach to management it is always necessary to consider the current needs of other departments in the archive. It is also difficult to maintain a distinction between technical and research activities, if the higher-end of technical work is considered. The preservation and restoration of film are processes that draw heavily on scientific knowledge and a well-established research tradition exists in these fields. This is reflected at FAA in the fact that the technical department are now involved in another European funded project in which they cooperate with industrial and academic partners.

Information retrieval

One task for technical staff is to contribute to the production of commercial videos that FAA sells to retail outlets. Such work includes identifying and extracting clips from FAA materials and the editing that makes these videos marketable.

Technical activities at the archive also include film restoration work. Restoration work is often required when a short cinema programme of, for example, silent films follows exhibitions in galleries. In order to

restore a film it is necessary to find out as much as possible about the history of the film. It is possible, for example, that someone will sit with several copies of the same film, which, for various reasons, are all slightly different. The task here is to establish a basis by which to judge how best to combine these different versions in a way that will engender a restored version most faithful to the goals of the restoration project. In this situation it is imperative to know why there are different versions and whether this was, for example, a choice made by the director or something imposed by the constraints of censorship in different countries.

Aside from the history behind the film it is also important to know what other versions of the film are available, what physical material they are stored on, what physical condition they are in and which version of the film they represent.

More generally, such knowledge of films held in other archives is an important resource. In addition to this it is also necessary, given the reliance on technology in this work, to keep abreast of technical developments in the field. Staying abreast of new trends is accomplished via membership of the German society for film and cinema technicians. It publishes newsletters and arranges seminars and meetings to present new knowledge to its members.

Information needs

Information needs are often short-term since they are directed at a particular work-process; for example, transferring material from 35mm film to videotape. It is also context-dependent to the extent that the information needs established in one work task will not always easily translate to another. What is important, then, is not technical expertise as such but, rather, how to combine this expertise with the constraints imposed by the materials one is working with. Knowledge of these constraints – e.g. what material was original recording made on, what is the current condition of the recording, how much footage is there, what is it of etc. – should, from a task analysis point of view, be distinguished from knowledge of how to operate the technical equipment.

Since FAA staff must follow technical developments in order that they can arrive at informed decisions regarding the purchase of new equipment, they need information about technology.

Information sources and tools

The majority of technical work is conducted with FAA's own materials so the most important source of information are the in-house databases. Unfortunately, the most important information pertaining to technical work, namely the physical condition of a film and the format on which it is stored, is not always available. Ultimately, then, it is the film themselves that are the primary source of information.

When it comes to restoration projects secondary sources are more relevant since the goal of the task can be constrained by various factors as noted above. Secondary sources could include literature from film theory and history, biographies of parties involved in the film and more general historical information about the time and place in which the film was made. In relation to the need to remain abreast of technical developments, membership of professional organisations is an effective method for obtaining access to new developments. In such organisations and especially through the journals they circulate it is possible to be informed both about new technological developments and new techniques, wherein old technology is applied in new ways.

7.1.4.4 Production and sales of products

Aims

Given the vagaries of public funding it is important for FAA that it is able to generate its own source of income. There are some basic areas in which strategic thinking comes to play a role in FAA's commercial activities.

There are strategies for exploiting the archive's information content and they are concerned with generating money. At the same time the archive's commercial activities should also be considered as a means for generating awareness and interest in the archive. These objectives are mutually compatible. The more commercially successful a project is then the more likely it is to generate interest in the archive. This formulation works equally well in reverse, not least because when considering ways in

which to commercially exploit FAA's information content the first question asked is, will people be interested in this.

Within the commercial services provided at FAA a main strategic issue concerns what criteria are established with regard to customer services. Although there are no formal rules it appears, in practice, that no response to a user inquiry should take more than one day. If possible this will be a full answer and if not then at the very least an estimate of how long a thorough search will take.

In exchange for the efforts FAA makes on behalf of its users it expects, in addition to the fee, to be acknowledged whenever material it has provided is used.

Utilising the materials it already has available, one strategy for this has been to produce videos compiled from newsreel and documentary film. Video production includes searching documentary and newsreel materials for relevant clips and checking film quality for what can/cannot be used. Archive staff select material and edit the videos whilst also handling the outsourcing of accompanying soundtracks. This process is very time consuming. Videos contain historical material from different parts of Austria, such as Tyrol or Salzburg, and are based on films from the archive's collection. The work has to focus on themes and products that are profitable. If the department doesn't make money on a current product they will have to find new areas.

As the intention is to sell these videos in retail outlets it is necessary that they be conceived at the outset as commercially viable projects. These videos must be based on themes that are likely to make people interested in buying them. It is important that FAA is sensitive to changes in audience's preferences. Videos are distributed and sold to customers in Austria and internationally.

Information retrieval

FAA also uses its collection commercially to provide services for customers such as advertising and broadcasting companies. In this case these companies usually approach FAA with a request about a certain type of film that they require. Such requests can be very specific and it is necessary for staff to be able to investigate FAA's information content in numerous different ways. This is a rapidly increasing activity with about 300 requests per year. Two staff members are dedicated to this work, and another two do similar work for Wochenschau. The material is licensed and comes from diverse sources, e.g. commercials, newsreels and documentaries.

Using material drawn from within the archive and through collaboration with other related institutions FAA also runs a programme of retrospectives.

Retrospectives give the archive a high visibility locally and internationally and they have a high priority within the institution.

Running a retrospective involves, choice of topic, advertising, continuous networking with the press, locating relevant films and accompanying materials (posters, photos etc.), clearing copyright, royalty payments, collaboration with other archives, creating further materials, such as postcards and posters, planning the opening night, analyse attendance figures, and selling materials produced. Sometimes research colloquia are organised in connection with retrospectives.

Along with practical arrangements FAA must also conduct marketing type work for any new retrospective. One typical method for achieving this is the production of a programme in which, along with an introduction to the theme, all of the films being shown are described in their historical context.

This task is information intensive so that, depending on the overarching theme and how this relates to FAA collective expertise, it may require a considerable amount of basic research.

Information needs

Knowledge of the archive's information content is also important for commercial activities at FAA. An overview of the available materials is central to the work of conceiving ideas for commercial videos. As noted above, the commercial focus entails that it is important for FAA staff to be sensitive concerning shifts in public interest or taste.

In relation to the commercial services provided by archive there is a need to undertake a deal of networking activity. This is useful for establishing links to potential new customers and obtaining insight into the direction being taken by existing customers.

In relation to the FAA's programme of retrospectives it is important at the outset to know what materials are available in-house, what and where material is available elsewhere and what obtaining such materials is likely to cost in terms of obtaining rights. Related to this is the need to have some idea as to what income a particular retrospective is likely to generate.

Information sources and tools

The most important information sources are those that allow access to FAA information content in the archive databases. The main obstacle to the FAA information content is the fact that these databases are stand-alone systems that only allow a limited range of search options. FAA's commercial activities have, however, contributed to the development of database resources inasmuch that, following a bottom-up method, new keywords are introduced on the basis of the research that goes into the production of a video.

Much of this basic research continues to involve the time-consuming process of watching original films in order to identify content. In certain cases this is straightforward, where the theme of the video is based on a specific year. It is more difficult, however, if the theme is more diffuse and demands that excerpts are extracted from films covering an extended time-span. Such an approach is required, for example, for the videos that have been produced in relation to some Austria's top tourist attractions.

Secondary sources are also important for the production of these videos; to assist, for instance, in the identification of events, locations and personalities, which are not always evident through the film alone. From a contemporary point of view the reasons why a particular story was deemed important is not always immediately apparent and secondary sources, such as books on the modern history of Austria, may also be useful here.

In addition to the information required in order to produce a film, information sources are also relevant to the conception of ideas for new videos. One source of information here is the success of previous videos; sales figures providing a concrete expression of popular interest.

Commercial users may also provide input to this process, especially those who are closely connected to the broadcast industry. When working with these users staff at FAA provide a library type service and follow similar methods. The specification of detail is even more important in this context, however, and relates not only to information content but to quantity, quality and format. When it comes to planning a retrospective there is a slighter greater freedom from commercial considerations inasmuch that quality criteria must also play a role.

Nonetheless, when it comes to making these plans, usually conducted in brainstorming meetings amongst staff who will be involved, there is a tendency to follow familiar routes. Previous experience has shown, therefore, that retrospectives work best if they focus on the work of one personality, preferably an actor. Once it is determined what the retrospective will cover it then becomes necessary to assess where films can be obtained, what versions are available, what condition they are in and what it will cost to obtain them.

The resources provided by FIAF are the most important in this respect as FAA has direct access to the film collections of other archives and to the expertise of film archive staff throughout the world.

7.1.4.5 Research

Aims

Considerable effort is allocated to research. Given that the overarching goal of research activities within FAA is to establish a position as the foremost authority on Austrian film the strategies adopted are partly determined by external criteria.

Research activities at FAA are, as anywhere else, driven by the need to produce original and stimulating work. In the case of the work now being conducted around the theme of censorship it was again recognition of absence, of the fact that nobody had previously examined this theme, which provided the original motivation. Of course it is not incidental that the information content at FAA, especially newsreels and documentaries from the 30's and the immediate post-war period, is an extremely rich source for this topic. To the extent that the imperative to collaborate can be considered a strategy then the participation in COLLATE indicates the success of FAA's research activities.

In the case of the Austrian filmography, for example, it was deemed necessary to undertake this project since, aside from being an important tool for those within the archive, it was an obvious absence in the resources FAA could provide for the international research community.

Information retrieval

The production of an Austrian Filmography has been a long-term project within FAA and is only now reaching completion. Although FAA owns most of the material that the filmography has drawn on this is the first attempt to collect information about so many films, cataloged according to various fields, and put it in one source. In the composition of the Austrian Filmography, which will strive to be the definitive source on Austrian film, a very wide range of sources will be required. Aside from the need to retrieve all of the relevant information pertaining to the filmography it is also necessary to search supplementary information that can help clarify otherwise ambiguous data and establish the validity of sources. This is regarded as a highly important research task, involving a great deal of interpretation and validation of sources, and screening of some films. Only one member of staff works with the filmography.

Staff participate in international projects, for example, on methods for archiving and restoration, which involves making well-prepared material available to the project partners. The material may include 1000 films from newsreels, feature films, documentary films and culture films that must be digitised and registered in a protocol.

A number of staff at FAA are dedicated to the production of academic work and as such are involved in information seeking relevant to this task. This includes accessing the materials in the FAA collection, gathering relevant secondary literature, making contacts with experts in a given field and developing an awareness of the forums in which academic work about Austrian film would be relevant. For example research and publications in the film history of silent films and in Italian censorship material.

Some user services are regarded as research, and especially those directed to researchers/research projects and questions, more detailed than with a library search, involving deep domain knowledge and insight into specific knowledge interests of research communities. Such services are followed up in several ways, for instance by purchasing new materials for the collections, ideas for retrospectives, the work on the filmography.

Information needs

Research activities in FAA are dependent on access to information that is both reliable and of high quality. In the case of the Austrian Filmography, for example, basic factual information does not always suffice because the raw data do not support clear-cut interpretations. A film may have more than one title, be found in more than version and have been the work of more than one director. In order to establish what information is important and what can be discarded it is often necessary to go into the social history of the period in which a film was made and into the history of the film itself.

For other academic work it is clearly important to have an overview of developments in the disciplines that provide an audience for film-based research.

Information sources and tools

Information from sources will be drawn from written materials that have been obtained in the FAA collection, the Austrian national library and other film archives. The form of sources and the methods for retrieving them will be more or less the same; although the Internet is used as a search tool it is considered to be too unreliable and is therefore used as a rough guide to what information is available. It is always considered both desirable and advisable to confirm information found on the Internet via other sources.

For academic research activities as a whole staff at FAA follow their academic training and adopt an approach similar to most academic departments. They obtain and read relevant journals in the field, follow new publications, attend and give presentations at conferences and generally try to make a name for themselves and FAA by circulating themselves and their ideas.

7.1.5 Work processes

Communication with users, either information or product related, is one of the predominant work processes at FAA. Face-to-face oral communication is the method preferred by FAA staff but telephone, e-mail and fax are also used. When FAA staff want to use the resources from other archives they are likely to use similar, with the exception of face-to-face conversation, communication methods. Electronic and written sources accessible by virtue of FAA's participation in FIAF are another resource to be drawn on. If such work is for the purpose of organising a retrospective then this research will aim to physically acquire film materials as well as providing a basis to write a programme for the retrospective season. More generally, it is necessary to keep a constant vigil over the material that FAA itself owns. It is necessary to physically check film to ensure that it is not deteriorating and to update and maintain records that provide a clear picture of technical quality of material stored in archive. In some cases this may be achieved simply by looking at the raw film while at other times it may be necessary to actually watch the film to make such judgements. Watching film is at any rate an important activity in many of the work tasks undertaken at FAA.

7.1.6 Configuration, object and tools

FAA has almost as many means of accessing its information content as it has types of information. At present, then, there are electronic databases that cover the archive's film collection, the library collection, documentaries and newsreels between the wars and documentaries and newsreels after the war. In addition to this, film posters, stills and publicity photographs are accessed via a card cataloging system. It is important to note that all of these databases are stand-alone, that is, it is only possible to interrogate one at a time and there is no cross-referencing facility. Beyond its own information content FAA receives much information about other film archives through its participation in FIAF.

The archive entered the 'electronic age' five years ago. Before that they had no computers and no local area network. To keep expenses down they bought the equipment and did the installation, cabling, and everything else themselves. In general, there has been little institutional coordination of the tools, databases, metadata, and work processes developed to manage and provide access to the archived material. Digital media have not attained thorough management attention. As a result, the archive has no IT strategy, except 'muddling through', and digital media have been left to develop on an ad-hoc basis.

As a result of this a number of local databases have been developed to classify, index, and provide access to parts of the collection. These databases have been developed individually to suit the needs of different projects. For example, seven of the 50 years of the Wochenschau has been digitised, made searchable, and put on a CDROM. This was done for the Wochenschau's 50th anniversary. The Wochenschau database is, however, a stand-alone database. It is not integrated with the other local databases in terms of, for example, a common format or a single point of access. New local databases are created on a when-needed basis. Currently, the archive has the following local databases:

- Books and journals
- The newsreel contents (e.g. the newsreel database)
- The Austrian filmography
- The film archive database
- Film picture database (a card catalog)

Since there are separate databases or card catalogs for each kind of material, the archivists often find themselves in situations where they have to search several databases and card catalogs to answer user requests. Knowing where to search as well as knowing the format, scope, and limitations of the individual databases requires interaction with colleagues knowledgeable about the different local databases. As one of the archivists expresses it "the best database is the brain of our colleagues".

Apart from the Wochenschau database, which also contains digitised clips from the newsreels, the databases contain bibliographic information only. For example, the Austrian filmography contains only the title of the films and an identification number. Information about the contents of the films must be found elsewhere. The archivists started indexing the contents of the films in a paper-based card catalog but lack of resources led them to discontinue this effort. Thus, there is no content description or annotations of films, apart from what the archivists carry around in their heads and what can be

found in books and journals. Once again, the only link between a film and a description of its contents in a book or journal article is usually a knowledgeable colleague.

Further, the lack of integration means that there is no common framework on which the different databases are based. This leads to recurrent problems with standardisation. For example, many old films exist in several versions with (slightly) varying titles or the title of a film has been translated into several languages or the title of a film is simply contested. This problem recurs in, at least, the Austrian filmography and the film archive database but a common solution has not been devised and enforced. Part of the reason for this is that the archive is not in control of the continued development and expansion of all the databases. For example, the film archive database is maintained in the repository in Laxenburg, and the archive receives updates on weekly update discs.

Apart from the databases, the archive has an Intranet, which is used to exchange and communicate information that is needed for such activities as coordination of work, performance of work tasks, and organisation of meetings and administration. The Intranet also provides access to the library's book and journal database and to the newsreel database. Almost all the staff use the Intranet to broadcast information internally. In terms of broadcasting information externally the archive has a website, which provides general information, gives short presentations of the available material and creates awareness of the services of the archive. The website is intended to help visitors get an overview of what they can expect from the archive. In this respect several FAA employees feel the website should state more clearly that people should come to the archive to get the proper service. Furthermore, the possibilities of showing and selling things – such as posters and photos – through the website is severely limited by copyright considerations.

The webpage of the archive contains a large amount of information and is considered to play a great part in visualising the archive. The front page of the FAA homepage serves as a billboard, advertising current and forthcoming retrospective seasons with carefully selected film stills. It also provides links to further information about the archive and the Austrian Newsreel Company. Following the link to the archive information is presented in an open form that, nonetheless, encourages the visitor to adopt a linear path through the history of the archive, its collections, the services its provides, special events it has organised and the visions it holds for the future. There are alternatives for the less idle browser, however, with information on individual staff members, their responsibilities within FAA and contact addresses. Contact information is provided for all staff but is also found in relation to the different services provided by FAA; that is, FAA try in their web-page to minimise further mediation with users by directing them to the individual who is responsible for the service they require. This division of labour is expanded in the section on services where there are more elaborate descriptions of what the archive can provide prospective users. Following the link to services links to a page that encourages enrolment on the FAA membership scheme. The advantages of membership are seen in the remaining pages on services where there is always one price for non-members and another for members. In addition to user services the FAA homepage also contains a 'shop' where visitors are able to browse through the different videos, posters and written publications that the archive produces and sells. Although it is not yet possible to conduct credit card transactions over the FAA homepage everything is in place to exploit such a facility when it becomes possible.

In connection with their work on newsreels (mainly Austrian newsreels but also some from France, United Kingdom, Russia, Belgium, and Mexico) the FAA employees at the Wochenschau have developed a wall-sized paper scheme. This scheme is used to keep an overview of the different phases of registration of the newsreels, of former work projects, and of specific project assignments such as the celebration of the 50th anniversary of the Austrian Newsreel. The scheme also serves as a historic overview of the archive's previous work on newsreels and the development of the newsreels. This is, for instance, evident in postings showing the changing names of the newsreels e.g. from Austrian Newsreels to Scope and then after 5 years to Halo-Kino, and frequencies e.g., from being shown twice a week to only once. The scheme serves as a time plan and specifies who is doing the layout, the production, the sending of the material, and so forth. The newsreel scheme helps the staff visualise what they have already done and what they need to do in the near future. Thus, the scheme is a means of locally and temporarily coordinating cooperative work (Schmidt & Simone, 1996).

To provide the basis for the production of statistics on how much and for what purposes the library is used, FAA staff fill out User Sheets with data about the users and their information needs. Apart from the production of statistics these sheets are used to guide the acquisition of new materials such as books, the development of new services, and – generally – to support the staff in developing the collections according to the users' needs.

7.2 Actors

Before the 1990s the FAA Collection was mostly managed by a few staff members who were specialists in film history. Introduction of new staff was conducted through unofficial mentoring, initiated through shared interests, personal "chemistry" etc. There was time to do the mentoring since the user services were at an early stage; mostly regular users coming to the archive. Domain knowledge had high status. During the 1990s, the institution moved to a larger building. The collection had outgrown the previous space. New and younger staff became key persons, including staff with an interest in coupling user services with documentation of research activities, PR-activities and collaboration with other archives. The institution merged with another institution producing newsreels, Austrian Newsreels production. The Sammlung Leutner was donated to FAA, and a new staff member was hired to catalog it. Domain knowledge is still important, but good communication skills and personal networking has, especially for key staff, become equally important.

Each staff member has a predefined "role", or rather, responsibility in the organisation. Some staff members work with one specific task only while others cover a variety of tasks, including new types of tasks. In the long term, professional roles develop along with the competence of staff. For some staff members, that have been in the organisation for many years, a broadening of competence has taken place through close mutual cooperation, commitment to visibility of organisation i.e. "unofficial policy makers" and "unofficial mentoring" and training etc.

The majority of the FAA staff members have academic degrees within the fields of history, dramatics, comparative literature, history and language. A small number of persons have worked at the archive or at the Austrian Newsreel for about 10 years or more whilst the majority of the employees have started working there within the last couple of years. Most of the archivists started working at the archive during their university studies and were later recruited to the staff. Most of the actors have specialised within some particular area of the film domain such as for instance documentary films, silent films and film history.

7.2.1 The archive's users

Around half of FAA's users are based oversees, reflecting the growing international visibility of the archive. The remainder based in Austria come to the archive as the result of hearsay or because they are referred by other institutions. FAA is also proactive in its attempts to attract new users and, aside from its Internet homepage, material about the archive is made available at other events e.g. retrospectives and, in particular, the archive's summer film program where films are shown in FAA's premises.

Four types of users asking for help about films from the archive that requires searching:

1. Lay users. Often approach the archive with very specific one-off requests. They may, for example, have a relative who was in the film industry and would like to find out any information about films that they were involved in. Although these users are casual and irregular, the archive endeavours to provide a service that would encourage them to return if they wished to pursue further information.

2. Professional Users. This includes fellow film archivists and historians and now, increasingly, experts from a wide variety of academic disciplines. The nature of requests from professional groups is more varied, possibly specific but also likely to be open-ended. When dealing with open-ended information requests FAA staff must determine, in collaboration with the user, when sufficient information has been obtained. Professional users will visit the archive on a regular basis and may learn how to short-cut search procedures on the basis of their previous collaborations with FAA staff. These users may also provide input that enhances FAA's knowledge of its own information content.

3. Student Users. Information requests vary greatly from the complex and open-ended through to the specific and simple. As there is no film based education in Austria the archive attracts students from various backgrounds. To accommodate this the library tries to follow reading lists of courses that have provided student users in the past. Students find the special and extensive nature of FAA's information content to be particularly useful when conducting dissertation work. The archive encourages students to conduct dissertation work with their resources as this provides a further means of learning about the archive's collection and students are usually happy to leave a copy of the finished product at the library, which can serve as a resource for others in the future.

4. Commercial Users. This category would include broadcasting companies who wish to screen a film on television or are involved in the production of a documentary. Aside from copyright issues and technical control there should be few problems in arranging the first type of request. In the case of the latter, however, more work may be required depending on the specificity of the request and the nature of the theme being covered in the documentary. The archive also receives requests from companies that would like to use images or film clips in advertising campaigns.

7.3 Work organisation

The overwhelming part of management activities are applied in public relation work so as to make the archive visible and to attract external funding and money, for example by selling products. Management has decentralised and delegated the work that requires domain knowledge to the staff that posses the required expertise. Hiring specialised staff is, for example, not done by the director but by key staff specialists. New staff are hired i) by referral from universities and other colleagues ii) from having worked as students in archive, and with studies in a relevant topic that provides specialised domain knowledge.

Management does not interfere, and does not actively encourage specific forms of communication and collaboration. There are no formal meetings among staff, and no formal meetings between staff and the manager, except for a weekly meeting with the technical staff. There are few rules, imposed by the management, which staff must follow. One rule is that staff can acquire what they need as long as the cost is below 20.000 Austrian Schillings. Social interaction takes place with management on such occasions. There are few staff meetings, most are initiated by the FAA manager and, for the most part, are of an informative nature.

The technical area in the video production is the one that is most demanding on resources and as such needs closer supervision. This is especially the case when it comes to deciding at what point it is necessary to purchase new equipment, but also applies in relation to publishing activities. There is one weekly meeting between the technical staff and the management staff. The work of the coming days, weeks or months is discussed and possible new international contacts are communicated to other colleagues. The technical staff have good opportunities to express opinions to the manager about, for instance, the need for acquiring new technologies or project participation. Ultimately it is the manager of the archive who approves the suggestions; decisions involving, for example, offering special prices to customers must go through him.

This is not the case with those work activities that address the mediation of materials and user services since they do not, to any great extent, involve earning money by selling products.

There are no formal arrangements to encourage collaboration at FAA. The absence of a formal apparatus may reflect the fact that collaboration works very well at an informal level. The informal collaboration is self-organised and determined during social interaction with colleagues. There is a need in the archive for close collaboration amongst colleagues. This is indicative of the number of staff and the resources available to staff for accessing the archive's information content. Staff at FAA cope with the constraints imposed by the various FAA databases by using their colleagues as information sources. With few resources and the dynamic nature of most of the work in the archive, it is most effective to adopt the principle of self-organising work. Role allocation must be determined ad hoc due to constantly changing criteria and requirements regarding competence access to information etc. Actors can then undertake several tasks with overlapping functions. The fact that staff share tasks contributes to the quality of communication that they have.

Due to the nature of the staff's competencies, self-organising work is possible. For example in the library, two actors share the same work function of searching for information for the users. These actors have fairly related educational backgrounds in the humanities (drama, comparative literature) and both have domain knowledge about films, actors, directors, ongoing research, etc. Part of this domain knowledge has been built up through creating retrospectives, which is one task that they have cooperated on.

7.4 Collaboration

Although collaboration is informal at FAA this is not to say that it is not organised. For the most part collaboration takes place in relation to specific tasks and hence things are organised according to the demands of the moment. Even though working-groups are formed for more complex tasks, such as arranging a retrospective, there remains a good deal of informality in the way they are organised. So group meetings may play an important part in the work but these are likely to be arranged when certain issues emerge rather than on a regular basis at a fixed point in time.

The archive itself is physically organised so that people who work most closely with one another are located in the same area. For this reason, members of working groups are likely to encounter each other regularly without making any special effort. The negative side to this is that without any special effort it is difficult to establish relationships with those located in other parts of the archive. As one participant put it:

“This is a very long building and the longer you have to go the less the people know about you”.

The physical organisation of the archive is based on the workspace requirements demanded by the different activities undertaken at FAA. The library, for example, is naturally located in the vicinity of the collections it provides access to. Although research activities do not have any real specific workplace requirements they are located in the vicinity of the library, as much of this work involves library based research. Although all the film material is stored at Laxenburg the requisite equipment for technical activities demands that a good deal of space is given over to this work. All of those who work with film materials are accordingly located in the vicinity of the technical equipment. In light of these factors, the physical structure of FAA and its informal methods for collaboration, some employees feel that they lack a sense of the work that is being carried out elsewhere in the archive.

Communication and collaboration between the different sections at FAA works very well. The reason for this is that the majority of senior staff have worked at the archive for a long time, have well established lines of communication amongst themselves and thereby operate as nodal points that serve to hold things together. It is for this reason that collaboration across different areas of activity is able to function in an effective manner.

There is much informal collaboration within the archive. In the library, for example, day-to-day tasks are divided through delegation and referral from one staff member to another. Some staff members function as 'key staff', or gatekeepers, for specific tasks that are shared. For instance, the head librarian, not only works with user services and library management, but also coordinates user services and requests, i.e. delegates to colleagues according to type of request, or relative daily and short-term workload in reference work and user services

While this functions well for those who have worked in the archive for a reasonable period it can also be an obstacle to those who are less well established. In terms of formal collaboration there are, of course, links to other film archives. Although at an institutional level such collaboration is formalised through common membership of FIAF, it is not always straightforward at a practical level. One actor explains that it sometimes takes an unnecessarily long time when she is searching for someone with expertise in a certain area. Unless she is able to contact the person directly the institution may take some time to figure out and find the person most relevant to her inquiry. While the majority of collaboration within the archive is informal there are areas where procedures are more established. Any member of the archive who wishes to make information available to the media must do so via the head of the library department

Consulting colleagues in individual work

Colleagues are a source of expertise in two ways. Firstly in relation to the knowledge they have of the film domain, and secondly through their knowledge of FAA’s information content and the ways in which this can be accessed.

In the first instance it is often self-evident who the most appropriate person to work with would be as they are the responsible party for the relevant materials; such would be the case, for example, with any inquiry relating to documentary or newsreel material in the inter-war period. In addition to this, since the archive is relatively small, most employees are aware of areas where their colleagues are interested and well informed. Without exception the personal interest that archive employees have in the film domain outstrip the areas for which they are responsible at FAA.

This is less so in relation to knowledge of the databases where those most closely associated with the system are most likely to be consulted. That there is a difference between these two says something of the information that is being accessed. When consulting a colleague's expertise the resource being tapped is non-transferable; specialised knowledge, perhaps especially so in the film domain, says more about life-experience as a whole than it does about a particular education. In contrast, it is relatively straightforward to learn how to operate a database and, with time, to become familiar with the information content of an archive.

Two criteria are used when choosing a consultant for an information need. One criterion is the domain knowledge. A colleague is for instance used as a consultant for film history aspects of users' needs. The other criterion is to choose the closest colleague in terms of common experience achieved through overlapping functions.

For example, only one member of staff works with the filmography. This staff member has ongoing collaboration with other researchers in film, including university staff, other filmography creators, other archives and other specialists in national film production and history.

Collective work in groups

Groups are formed ad hoc for special tasks such as arranging a retrospective and an exhibition, based on the situational criteria like workload, access to material, familiarity with the task etc. When a group of actors are pooling their resources and knowledge together in a collective activity it is usually not structured according to the normal work functions. Collective group work is usually driven by the goals and constraints of a particular event.

Collaboration in teams

Collaborative information retrieval is a prevalent activity. The archive's library service slowly changed into the use of a collaborative information retrieval method, where a customer's information need is solved by a cross disciplinary team. The CIR work is informal and self-organising, e.g. the collaboration is initiated ad hoc according to the local and situational demands from the dynamic activities of the archive. The users have learned that they can ask very specific questions. Before they would come with more general and open-ended questions, whereas now they know that they can also get help with very specialised information needs. By word of mouth this new service has encouraged and increased the number of users.

There is consensus among the actors that they share the archive's users and that this gives the best service. A current awareness of what is going on in the archive is present, and a common and shared knowledge about the film domain and its users is one visible result of collaborative information retrieval.

Apart from being effective, the collaborative information retrieval approach is also motivated by its effect on learning. Staff learn from each other and the users learn from the staff. "you never learn so much film history as by searching for some weird theme that you might never think of, but you start to use magazines and things like that and you find so much information that can't be taught at universities".

Some user services are regarded as research and especially those directed to researchers and research projects, involving deep domain knowledge and insight into specific knowledge interests of research communities. Such services are followed up in several ways. For instance by purchasing new materials for the collections, ideas for retrospectives, and the work on the filmography.

The staff members in the preservation and restoration department have been there for a long time and know each other well. The three employees seem to possess equal positions and help each other complete their tasks. There is, however, a clear division of labour according to their different expertise. There is also a sequence in which the tasks are done. One employee types in textual information about the newsreel, another digitises stills and film clippings and transfers these to the database and another does the actual cataloging of the newsreel. The staff members are mutually dependent on the effective execution of these work tasks in order to be able to fulfil their own goals. This department also collaborates with the IT specialist on a new project for multimedia archives concerning the creation of new software that uses the m-peg 7 compression format. This project involves both software and research partners from Austria, Greece and The Netherlands.

In the video production of historical films based on archive materials, working with colleagues within the archive entails identifying relevant themes, locating the appropriate material, extracting this material and integrating it into a commercially acceptable product. Cooperation takes place with staff from the Austrian Newsreel Company on video production, though it is stressed that they are an independent entity within the archive. This distinction implies that even though the Austrian Newsreel Company and FAA are now one institution there are still some differences that may influence the work of both departments.

Academic work takes place in close collaboration with colleagues in the archive on academic publications and dissemination activities. This entails writing and collaborating on the production of articles and books e.g. Austrian filmography.

Collaboration with institutions

Collaboration involves contacting external institutions and establishing contacts to other academic, public and commercial organisations. Collaboration with other institutions has scaled up, possibly due to changes in film research and increasing cross-disciplinary research interests. Networking is, therefore, important for keeping up domain knowledge. The library and archive has of late experienced a massive growth in cooperation with other institutions that has allowed them to exchange resources. Materials such as books, films, grey film-literature, festival catalogs are exchanged with other archives that are members of FIAF.

FIAF has a website that provides links to the archives and a manual providing an overview of the material they hold. This is used for the locating and acquiring of films. FIAF also publishes a CD where precise information is provided about the location of very rare or valuable material. They hold a yearly congress in which delegates participate on film collection restoration and preservation topics, for example on nitrate films. It is, therefore, important to maintain the contact with FIAF and attend to meetings and congresses in this organisation.

The archive collaborates with BBC and ARTE - a TV-channel that focuses on cultural programmes and broadcasts in Germany, Switzerland and France. They also work together with Canadian and French TV-stations and have some Chinese connections. In earlier times there were lists e.g. the International Newsreel Association's pool of material containing the newsreel material that was available to all companies in Europe and all the different companies could order material and get negatives. This functioned as an exchange of information between partners and only special requests, for instance a colour print, would require any fee to be paid.

Users are often referred to Austrian Wochenschau and the National library, which has important posters and photos, and other libraries in Vienna. In the institute of Modern History the archive shows films. The Berlin Film Museum (Deutsche Kinematek) and FAA conduct research e.g. towards a Fritz Lang silent film retrospective at the Berlinade.

On silent films and film censorship the FAA collaborates with Italy, Hungary and DIF in Germany

Compilation of filmography requires ongoing collaboration with other researchers in film, including university staff, other filmography creators, other archives and other specialists in national film production and history.

There is a frequent contact with journalists and newspapers.

7.5 Coordination and division of work

Coordination of work takes place according to social norms and practices that have been developed during the last 10 years by the archive's staff. Co-ordination of work is more or less formal depending on the area of the archive. It is more formal in relation to video production and collaboration on technical projects such as film restoration. This may reflect the fact that this work is less dynamic and driven by the staff, not by unpredictable, daily customer needs. The staff are able to plan their own work, create the videos and make propositions for what they would like to do in the near future and on a more long term basis. They then cooperate with the manager about the next steps to be taken.

It is not so much that there are not meetings in relation to specific tasks but, rather, that such meetings are arranged on an ad hoc basis depending on the perceived need to coordinate and allocate activities.

The lack of formality is reflective of the archive's small size and the fact that, since everyone knows more or less what everyone is doing, it is possible to coordinate, so to speak, off-the-cuff. The most important factor in the coordination of work appears to be the clearly established expertise of archive personnel in specific domains.

Within the archive several persons seem to work on similar topics within the area of the newsreels. There is, however, a clear division of the work according to the production year of the newsreels. The Austrian Newsreel Company deals with newsreels from 1949-1995 and two other staff members from the archive deal with the material that precedes these years. When work is being planned the staff members sit down together and discuss different approaches to the tasks and what needs to be done. When the company work on special projects they have previously employed freelancers that could contribute with their special expertise and help reaching deadlines.

7.6 Communication

Communication with colleagues usually takes place at a face-to-face level. Aside from the weekly meeting for the technical staff and management, there are no established forums for communicating with colleagues. Some actors expressed a preference for dealing with users in person; though they admit that much of their work with users is also conducted via e-mail and over the telephone. Although there is much in the way of face-to-face communication, there is a relationship between the physical proximity of people in the building and the closeness of the working relationships. It was more likely that one would communicate regularly with the people in adjoining offices than with those further removed in other parts of the building.

7.7 Collaborative information seeking task situation

FAA offers a wide range of information services to its users, from delivering specific materials to exploring particular research problems. Collaborative information seeking is the basis of FAA's information services and involves the following steps:

1. Filtering user requests and directing the user to one of the functions within FAA and ensuring that the user is connected with the right actor within the organisation

2. Once the activity has been delegated, the actor communicates with the user in order to determine what resources to mobilise in order to work with the request. These resources can comprise colleagues within FAA; materials within FAA; institutions and persons outside FAA, in Austria as well as other countries; and materials outside FAA.

The collaborative contexts for information seeking in FAA include:

- The functional division of work into information seeking and cataloging; maintenance and management of collections; preservation and restoration activities; and production and sales of products
- The staff's expertise in specific historical periods, themes and topics, materials, their strategies and tactics in decision situations during information seeking, including 'filtering' of user requests, and their ongoing networking with external institutions and persons;
- The current developments in film research towards divergence and multidisciplinary approaches; there is at present neither an overall research programme nor a shared/standard methodological approach; no specific curriculum in film and media studies in Austria
- Opening hours and space; reference library and collection for non-commercial requests;
- The users' needs, preferences and strategies

Thus, some collaborative contexts are related to the institution's domain e.g. functional division of labour, opening hours and staff expertise, whereas others belong to the users' domain i.e. information needs, preferences and strategies, current conditions for film and knowledge production. The linking between institutions and the users' domains that occur during the tasks of collaborative information seeking is important for the production of new knowledge in both domains.

For the actors of the institution, high priority is given to depth as well as diversity in domain knowledge. Through interacting with users and networking with colleagues within and outside the institution, the actors learn about new developments in the field and can also mediate this knowledge to the users of its services. This is the culture of the work place that all actors have to learn. The users' information needs are not only regarded as "requests" in a narrow sense, but as possible contributions to building up the institution's services, collections and ongoing research for instance, the filmography. The staff has various strategies for mobilising such contributions from the users, including getting the users to the archive for face-to-face communication and collaborative information seeking; arranging retrospectives, exhibitions and research colloquia; producing and selling videos compiled from newsreel and documentary films.

7.7.1 Role allocation in collaborative information seeking task situation

The delegation/filtering of user requests to one of FAA's functional activities is done according to an initial assessment of the type of information need that a user has and its relationships. When the information needs are related to:

1. materials of the archive, the request is delegated to the archive staff. However, this delegation can also occur because of specific expertise and network among the staff of the archive.
2. factual information and as well as more complex information problems, like specific research problems, the request is delegated to the library; again, this delegation can be decided because of specific expertise and network among library staff;
3. preservation and restoration techniques, the request is delegated to the function of technical activities; these information needs are often short-term, because they are directed to a particular work process
4. videos and newsreels the request is delegated to commercial activities.

During the year 2000, most of the information needs among the users of the library were related to:

- Film history
- Directors
- Actresses and actors
- FAQs, for instance names of actors, directors, films, etc.

For collaborative information seeking in FAA, four types of role allocation occur:

- The actor who gets the request has control of the service to the users by collecting information from their own knowledge, colleagues' knowledge and materials, such as written information sources. This information is filtered by the actor and then communicated/given to the users;
- The actor who gets the request shares it with one or more colleagues. The control of the service is discussed and negotiated in the team, and a decision is made on when and to whom the control shifts in accordance with constraints such as work load and specific expertise;
- The actor that gets the request responds to the extent possible and then sends the users to colleagues within or outside the institution where they can get more information;
- The actor that gets the request recognises the area of expertise of a colleague, redirects the user to the colleague and asks the user to call the colleague at a time where s/he will be available.

A locally developed user request form has been created, functioning as a coordination mechanism for collaborative information seeking at FAA. The user request form is applied for:

- sharing the users' need formulation and the main characteristics of the user (scientific, commercial, etc.) among staff involved in information services.
- tracking the delegation of a user request to staff members.
- tracking the status of the search process and history.

- contractual agreement between the user and FAA on the use of FAA's services and materials.

Collaborative information seeking in FAA also involves interaction between the intermediaries and the users, where the intermediary's task decisions and the users' task decisions iterate between a number of steps. The following prototypical collaborative information-seeking task involves a scientific user (a historian involved in cultural research) and an intermediary from the library with expertise in the film domain and drama studies. The analysis of the task decisions involved is based on interviews with the user as well as the intermediary.

7.8 The archivists' role in collaborative retrieval decisions

The objectives and goals of the intermediary are to promote cultural mediation and to increase knowledge and participation in national research activities in the film domain. Furthermore, the efficiency of user services has a high priority (visibility of institution, enrolling the user in knowledge sharing with institution). Through collaborative information seeking together with the users, the intermediary not only gains new knowledge and expands his/her professional network, but also elicits ideas for acquiring new materials in collection. The highest priority of the intermediaries at the FAA library is the *users' needs*. The collection, databases, the activities linked to collection building, preservation etc. is a *means* to achieve this end.

The collaborative information-seeking task in FAA involves a number of prototypical decisions and iterations by the archivist:

- Situation analysis
- Planning
- Formulation of search queries
- Localising materials
- Delivering results to user
- Negotiating search results and relevance feedback

Situation analysis

The purpose of this iteration is to determine how the users' goals and priorities match the means, ends and priorities of FAA. The user's request is interpreted in terms of goals, priorities and preferences in order to decide on an initial procedure for handling the request, including 'filtering'. The preferred strategy is face-to-face communication with user in FAA. The communication can also be mediated through telephone, e-mail and letters. As a search proceeds, the intermediary communicates with the user on intermediate search results etc., eliciting possible revised or new interpretations of the search request.

Planning

This iteration involves the following:

- Set-up of search strategies, selection of search tools (databases, card catalogs) and selection of local non-cataloged collections to explore (photo archive, Sammlung Leutner etc.).
- Decision to stop search (result ok, "time is up", delegate to colleague etc.).

Formulation of search query

- Formulation of query and translation to applicable query languages/filing order, attributes and terminology in databases and card catalogs.

Outcomes

- Lists of search results.

Localisation of materials

- Localising materials in archive, including searching for non-cataloged materials in special local collections.

Outcomes

- Materials.

Delivering results to user

- Copy items to user.
- Make items available in presence library or for screening (films, videos) in archive.
- Purchase item(s).
- Borrow items from other institutions.

Negotiating search results and relevance feedback

- Validation of the usefulness of the search result with user.
- Possible re-negotiation of request with user (corresponding to revised situation analysis).

Outcomes

- Broadening the request.
- Narrowing down the request.
- Stop search.
- Refer the user to outside institutions for further materials and information.

7.8.1 The users' role in collaborative retrieval decisions

The objectives and goals of the user involved in the prototypical collaborative task situation are to contribute to national cultural research, including contributing to research activities at his institution. The user is a historian and head of studies at a local academy in Vienna. The user comes regularly to the FAA in order to look for information for a research project about the cultural meaning of time. Important constraints are a deadline on a current funded cultural project and lack of expertise in the film domain. Additionally, the user is constrained by the library's status as a reference only facility.

The user's goals are to obtain secondary literature related to his specific focus on investigating the cultural meaning of time in Austrian films from the 1940's, 50's and 60's. The user's research problem is constrained by the fact that it is formulated within a research area that is characterised by high degree of strategic task uncertainty (Whitley, 1983). In addition, the film aspect of the research problem is not within the scope of the users' current expertise. This means that the area, within which the user's project is formulated, constitutes a multidisciplinary information search landscape, where knowledge production appears as fragmented, and with a high degree of diversity of concepts, objects and terminology. Furthermore, the associated research area is characterised by a high degree of strategic dependence among experts. This includes dependence on expert intermediaries that have domain knowledge in film, and experience and insight into the different kinds of literature and media produced; and who have heuristics, strategies and tools for delineating possible key literature and materials that can inspire and focus the research work by the scientist.

The high degree of strategic task uncertainty for the users' current research project implies that an overall search request cannot be formulated a priori, but involves a number of iterations between formulating queries in databases and browsing the collection. Hence, the applied and agreed search strategy is a combination of collaborative browsing and analytical search strategy, involving iterative explorations of materials, databases and catalogs.

During collaborative browsing, the user's focus varies from, for instance, gaining new knowledge and learning about the film domain; evaluating and reading retrieved materials; "chain searching" which is a very common search strategy among humanistic researchers, involving selection of references and sources from the literature. In accordance with the shift of focus by the user, the roles of the intermediary vary from educational by mediating domain expertise to search agent. Mediation also involves consulting by suggesting ideas for materials at FAA that may be within the scope of the users' research problem. The role as a search agent provides tools, search strategies, query languages, etc.. During this collaboration, the user and the intermediary discuss what materials may be lacking, and what new domain knowledge the user must obtain in order to reach his goals. The strategies applied by the intermediary involve teaching and

Means-ends representation in CIR task situation	**User's work domains** **A case example**	**Institution/** **Intermediary's work domains**	**COLLATE system**
Goals, constraints, *Priorities*	Goals: Basic cultural research, on the cultural meaning of time. To build up film knowledge through interaction with intermediary and other colleagues in archive. Constraints: High degree of strategic task uncertainty. Deadline approaching. Presence library.	Goals: Cultural mediation. Efficient service to user through consulting and educating user in film domain.	Goals: To ensure collaborative accessibility of cultural heritage. To establish evidence for the acceptability of a collaboratory for the historical domain.
Task decision	Seeking information and materials. Selecting, reading and evaluating materials. Consulting intermediary.	Situation analysis. Planning searching and browsing. Collaborative searching and browsing. Renegotiating user request.	The knowledge base of the collaboratory contains representations that match prototypical task decisions
Search strategies	Collaborative browsing of collection. Chain searching.	Analytical search strategy. Empirical search strategy. Browsing. Switching between search strategies.	The interface in the collaboratory is designed to support dynamic switching between prototypical search strategies
User/actor characteristics	Historian. Expert in historical research. Novice in film domain.	Drama studies, journalism. Expert in film research and mediation. Expert in information retrieval.	The actors' knowledge, roles and characteristics are described in databases of persons' expertise in the collaboratory
Subjective preferences	To read and evaluate retrieved materials at work place and at home.	Face-to-face communication with user.	The collaboratory contributes through interactive communication facilities for downloading digital information and materials
Role allocation in task decisions	Presents information need to intermediary. Evaluates relevance of retrieved materials.	Probes user's information needs. Suggests sources, etc.	The collaboratory is open to annotations by staff and users about the usefulness of materials for specific contexts. The collaboratory provides access to previous requests and their solutions within related problem domains.

Figure 7.2: Coupling user's domain to institution's/intermediary's domain through collaborative retrieval.

coaching, current awareness and pro-active information services. Finally, the choice of search strategy by the intermediary shifts according to shifts in the user's focus and ideas, and the user's new insights into the film domain.

Situation analysis

The user presents the request to the intermediary. This involves presentation of the user's goals, priorities and constraints. This includes the constraints of the deadline, the need for coaching in domain knowledge and for consultancy by the intermediary on what kind of key sources to start with. As the search proceeds, the user communicates with the intermediary on search results. This implies that the step of situation analysis goes through a number of iterations, based on continual evaluations by the user of materials and literature, and the users' new insight into the film domain. Furthermore, iterations occur due to the intermediary's continual re-interpretation and understanding of the users' preferences and needs, for instance manifested in decisions on pro-active services to the user.

Planning

The user and intermediary switch between two applied search strategies, collaborative browsing and

analytical search, and they explore the collections and databases together. Based on output from databases, skimming or reading materials from collection etc., the user OR the intermediary sets up a search profile for an analytical search. Based on output from the analytical search, renewed situation analysis and the user's relevance assessment, the user and intermediary switch to a collaborative browsing strategy. This switching of search strategies continues, until a mutual decision to stop search is reached.

Performing searches (processes)

The intermediary performs the search process at FAA. Because the intermediary trains the user in domain knowledge as well as searching, a delegation to the user of some searches, for instance for "known items" found in reference lists, would be feasible in an electronic environment, such as COLLATE.

Receiving and evaluating results

The user wants the materials at hand (at home, at work) in order to have peace and quiet to read, skim and analyse. Requirement: access to work space of digitised documents in the collaboratory.

7.9 Collaborative search strategies

The strategies that searchers use to plan the search and the criteria for choosing among the different strategies in an information environment were originally studied in 134 examples from a set of user-intermediary negotiations collected in 1976 in Danish public libraries under everyday library conditions. The study involved the analysis of strategies employed by end-users and intermediaries. The aim of the investigation was to reveal the various tasks and search strategies, which the user/intermediary encounters in everyday work in public libraries (Pejtersen, 1988). The different search strategies represent different ways in which users and intermediaries categorise information during information retrieval in libraries. The strategies are implemented in the Book House with the exception of the empirical search strategy. (Rasmussen et al., 1994). The five search strategies are:

- *Analytic search strategy*. A rational problem solving strategy where the dimensions of the user's needs are explored systematically and need aspects compared with record aspects. This strategy is employed when explicitly formulated information about the user's need is available for comparison with the contents of the collection.
- *Empirical search strategy*. This strategy is based upon the intermediary's purely empirical classification of users into typical categories, which are associated with a repertoire of typical sets of genres and records, the contents of which the intermediary often does not know in detail.
- *Browsing strategy*. This strategy is characterised by a lack of requirements to record specificity. The search can be part of a process of need recognition, of search question formulation, and of a learning process, where the strategy is a means to get new knowledge or new associations and ideas.

- *Search by analogy*. In this strategy a specific item mentioned by the user is the basis for the retrieval of new records with features identical to those of the model item. The search is therefore a search in a network of relations between attributes of documents in order to achieve a match between records in the collection and features of the named item.
- *Bibliographic search strategy*. In this strategy the user and the intermediary communicate in library terms and they are occupied with the user's need in terms of authors, titles, and other pieces of bibliographic information.

The strategies were identified in the interviews with the actors of the three archives and they are used in the search and mediation processes involving archivists and archive users. The search strategies are results of the decision-making that takes place during the interaction between the actors and the elicitation and negotiation of the user's information need.

7.10 Collaborative cataloging, classification and indexing task situation

The cataloging task at FAA involves document analysis, document description and classification/indexing. The primary media applied for cataloging are stand-alone database systems for the library and the newsreels, but card catalogs are also used, as is the case with the photos and posters collections.

The objectives of cataloging are to enable:

- Accession of materials (books, magazines etc.)
- Collaborative and individual information seeking of materials in the collection
- Ordering materials in the collection in terms of collocation (where in shelving)
- Localisation of materials (in what collection)
- Maintenance and update of database

The expertise of the catalogers is primarily related to:

- Types of materials (books, journals, photos, newsreels and videos, posters, stills) and the domain knowledge that they document
- Versions and physical condition of materials
- Types of user requests to databases and collections
- Cataloging and indexing rules
- Information seeking strategies and processes
- Database management of stand-alone systems

The collaborative contexts for cataloging in FAA are:

1. The functional division of work into information seeking and cataloging; documentaries and compilation of filmography; production and sales of video/newsreel products.
2. The catalogers' expertise in specific materials and domain knowledge, their strategies for document analysis and description, indexing languages, cataloging rules, reuse of cataloging data, and networking with external institutions and persons
3. Current developments in technology (database systems and information retrieval/archiving systems, digitisation of materials)
4. Dictionaries, thesauri, classification systems
5. Vendors, donators and other external sources, such as other archives, for accession of new materials

Some collaborative contexts are related to the documents' domain (authors, directors, titles, content, etc.), whereas others are related to catalogers' domain (rules, strategies and decisions) and to the systems' domain (databases, dictionaries, classification systems etc.). The linking between these three domains is currently achieved through internally developed standards by each function in the library, in newsreels/video production, and filmography. There is at present no overall standard for sharing or reusing data between the different cataloging functions, except that each function utilises the same database system for cataloging, but with little coordination of applied formats, cataloging and indexing rules, document analysis and indexing tools. This is clearly demonstrated in the above section on configuration, objects and tools.

For the actors involved in cataloging, high priority is given to correctness of cataloging entries according to internally developed standards. Furthermore, high priority is given to interacting with users. This includes information seeking for users of FAA as well as participation in research or documentary projects with institutions outside FAA and education of catalogers in other institutions. This diversity of role allocations, from cataloging to user services or to research and documentation, provides for a user-oriented approach to cataloging and indexing, and hence, for matching user requests to the contents of the databases and card cataloges. It also provides the catalogers with opportunities to collaborate and share knowledge with other experts in FAA, and thereby develop their domain knowledge and set up new assumptions on users' needs.

7.11 Collaborative cataloging,classification and indexing decisions

When a new document/material arrives, the cataloger makes a number of decisions. These decisions are carried out in iterations. The decisions are as follows:

Judging relevance

This task decision involves identification of the characteristics of the document. Is the document already in the database/catalog, what is its type (book, magazine, film, etc.) and how is its physical condition (version, length of film, documentary etc.) Subsequently, the document is skimmed/screened by cataloger/filmographer in order to describe its content. This analysis is an interpretative process, requiring a high degree of domain knowledge, including assumptions on possible target groups for the item, as well as possible requests by users and prior experience in content description (abstracts) and subject indexing. The interpretation also involves assumptions of priorities/planning cataloging and indexing depth for a particular item, in particular with respect to long term as well as short term potentials for the usefulness of it in the context of the collection, the filmography, sales etc.

Subject analysis, indexing and content description

This task decision involves planning screening, skimming and analysis and description of the document. This task involves a number of complex cognitive decisions on:

1. Expressing the content of the document in a written abstract that can provide the reader/user with an overall idea and insight into the story/message of the document
2. Analysing the subject(s) of the document and articulating the subjects using indexing terms and/or classification codes. The decision on how to articulate the subjects of a document is important to ensure that the document is retrieved as a result of a subject search during information seeking. Furthermore, the decision on shelving classification code is important to support browsing of the collection, where related items are collocated according to their related classification codes.

These task decisions iterate with the decision on judgement of relevance: for each new document, it is decided if new indexing terms or classification codes may be warranted in order to express innovative topics/contributions by the document from the catalogers' and the users' point of view.

This phase will often involve collaboration with colleagues that are experts on the specific type of material or its assumed topics, either through consulting colleagues at FAA or in institutions outside FAA. Furthermore, it can involve consultation of dictionaries, handbooks and Internet sources in order to verify incomplete titles, unknown originators, etc. The collaborative situation analysis will often be initiated from a number of 'rules of thumb', ranging from prior experience of what publishers' or vendors' information is usually correct to knowledge about the production forms and conditions for particular types of materials. Furthermore, the coordination mechanism, the user request form that has

been created as a tool for documenting and tracking user requests can be applied to support subject analysis of a document in order to support user-oriented indexing.

Planning cataloging

This task decision involves deciding on the attributes of the document (title, author, originator, publisher, distributor etc.).

Entering data in database or card catalog

This phase comprises a number of steps or processes:

- Get an empty record, select fields for expressing decided attributes of item
- Consult lists of existing attributes in database, enter document description data from lists, or type new data. This step can also involve consulting dictionaries, in particular for translation of titles, correctness of name entries etc.

If a record of the item exists in database, a retro cataloging of the item may be decided

Finalising cataloging

Save new record in database, check update of database; shelve new item in collection for information services.

7.12 Needs arisen from the work analysis of FAA

According to the field studies of archive work conducted so far, a shared virtual collaboratory on the web should be based on the needs presented below. A collaboratory should also support the existing collaboration and face-to-face communication that is highly valued by the archivists, their professional networks and their users. The purpose of this analysis and the subsequent recommendations is to provide a source that can inspire the user requirements for the COLLATE Collaboratory. These are ways in which the current way of working combined with new opportunities may help in accomplishing the goals and work activities of the archive.

1. Content access to FAA collections.

The most important information sources in a collaboratory are those that allow access to FAA information content. The primary need at the majority of work tasks carried out in the archive is easy, efficient, reliable and high quality access to content information. It provides the basis for user services, management and maintenance of the archive and its tools, and acquisition of new material. An overview of the available materials in the collection and its content is also central to the work of conceiving ideas for commercial videos, research, international collaboration etc.

Content information should be provided on all materials. The main conceptual obstacle to the FAA information content is the fact that there is at present no current standard indexing approach (indexing policies, indexing rules and indexing languages). A common model is needed that allows for multiple perspectives and facets for analysis and representation of content and other attributes for all the materials in the archive. A common model works as a "meta scheme" that can be used as a basis for creating a standard format in the database, while still allowing for adaptations to fit future developments in the semantics of the domain. Such a common format may additionally be used as a way of extracting information from local classification schemes into a uniform format and thus enable searching that can span over several classification and indexing schemes. The common model or "meta model" should be based on an empirical analysis of the information needs of the actors' use of the different kind of materials. Commercial users may also provide input to this process, especially those who are closely connected to the broadcast industry. Furthermore, the "meta model" can be devised in such a way that possible value-adding to future databases by users (user enrichments) can be accommodated, for instance in separate fields of the database, allowing for possible user perspectives on document representations in the databases.

Common language and terminology is another crucial issue for a collaboratory. A controlled vocabulary for classification, indexing and annotating all materials, people, institutions and selected work activities would be one way of addressing the standard issue. Another approach would be the development of

switching languages, cross-lingual thesauri, and subject converters. Furthermore, there is a need for tools supporting metadata management in the collaboratory, for instance supporting terminology control (synonyms) and semantic control of the content access to the databases, for instance in the format of thesauri or (overlapping) clusters of indexing terms that are semantically related. Further facilities could include tools for syntactic indexing, for instance for entering strings of terms in order to counteract ambiguity during retrieval ("false drops").

The proposed domains for a collaboratory with one database are:

- Materials
- Colleagues
- Customers
- Experts
- Archive's users
- Institutions
- Selected work activities

Another obstacle to FAA's information content is the fact that their databases are stand-alone systems. For the staff, users and the public participating in a collaboratory, there should be one common database that contains all the materials in the archive: Films, videos, posters, scripts, memorabilia, sound, newspapers, books etc. Each search should include all the materials.

Coordinated cataloging

At present, cataloging entries in FAA's databases are created from scratch, and there is little coordination of cataloging approaches and activities. Cooordination of cataloging approaches in FAA is needed in order to reach an optimum level of cataloging quality and correctness across the different databases. Such coordination would be crucial to support exchange of cataloging data within the institution and with relevant external collaboration partners. Data exchange, in particular with external collaboration partners, may reduce the duplication of work, and hence the effort of cataloging with respect to time. However, data exchange is at present constrained by the fact that the database systems at FAA are stand-alone systems. Furthermore, there are no back-end facilities, such as converters, to handle exchange of data with other institutions. Data exchange with other institutions in addition requires agreements on degree of compatibility between cataloging formats applied and agreement on what level of cataloging should be common for the institutions involved.

Value added attributes

There are many specific examples in the field studies of value adding attributes to the materials. In addition to information content, work with broadcasting companies, retrospectives, restoring films or creating new products suggest quantity, quality and format. Locations where films can be obtained (archives, museums, private persons, stores, distributors), what versions are available, what condition the original and current artefacts are in, and what it will cost to obtain them; events, locations and personalities, which are not always evident through the film alone.

Integration across departments

The requesters' interests do not follow the division of labour inherent in the division of the archive into a number of departments. Many requests can only be answered by collecting material from several departments and this calls for an integration of the different collections into an inter-linked entity.

2. Content access to people

The staff at FAA are very adept at using each other as sources of information. A collaboratory should support the call of a local or external colleague with a different area of expertise to assist in a work process. Access to information about the activities, the work domain and task expertise of colleagues, customers, consulting experts, and the archive's users is important. Networking with customers is useful for establishing links to potential new customers and obtaining insight into the direction being taken by existing customers. The resources provided by FIAF are the most important in this respect as

FAA has direct access to the film collections of other archives and to the expertise of film archive staff throughout the world. This requires a classification scheme that reflects the questions that archivists ask, when they look for experts, institutions and archives.

Documenting the users' current diverse research activities such as dissertations, books etc., by the archive's users should be part of a collaboratory. Currently, users of FAA 's information services are required to sign a form in relation to each request they make at the FAA. This form could be made available in an online version, extended with further attributes. Some would pertain to the domain of the user (name, affiliation, abstract of their current research or description of their current interests in the film domain) and some would address the archive's filtering and delegations of the requests during information searching tasks. Some of the information for the users' domain could be entered by the end-users, whereas other type of information would be entered by the staff. An updated documentation of user requests would enable the staff to follow general trends in user preferences. This will improve the user service and support communication and collaboration among the archive's staff, and collaboration with the archive's users. It will provide an overview of areas of interest and, given this, what subjects could be more thoroughly covered in the library collection, and what terms should be chosen in cataloging. Online access to user sheets with personal data about the users and the theme of their information need can also be used for the acquisition task and will thus reflect users' needs. Furthermore, such a facility can be used for exploring prior solutions to requests, and for setting up current awareness services for the users. Such information will also be very important for new staff.

3. Content access to institutions

Staff in the archive need to obtain and exchange information with similar institutions both in and outside of Austria, given that FAA sometimes is not able to meet the demand, and a user might look elsewhere for the information they require. In relation to the FAA's programme of retrospectives it is important to know what and where material is available elsewhere and what obtaining such materials is likely to cost in terms of obtaining rights. Through FAA's participation in FIAF and through the personal initiative of FAA staff, their collaboratory should include these extensive links with the international film archive community and related institutions both inside and outside of Austria.

4. Access to high quality references

To facilitate research activities, filmography work and cataloging through a collaboratory, it is often necessary to go into the social history of the period in which a film was made and into the history of the film itself. This is dependent on access to scientific reference material and handbooks. Academic film research is cross-disciplinary, and it is useful to have an overview of developments in the disciplines involved in film-based research. Secondary sources are also important for the production of videos such as books on the modern history of Austria.

5. Content access to selected work activities

One source of information that is relevant generating ideas for new videos is previous videos. In relation to the FAA's programme of retrospectives, there is a need to have information about the previous retrospectives, their materials, costs and profits etc. to obtain some ideas as to what income a particular retrospective is likely to generate. Sales figures provide a concrete expression of popular interest. Critiques in newspaper and other kinds of reviews can provide relevant feedback and such information should be accessible in the collaboratory.

6. Access to information about videos

The commercial focus and the user service focus entail that it is important for FAA staff to be sensitive concerning shifts in public interest or taste. Some of this can be achieved through mutual links to videos on the shelf and preferably its content in commercial video stores. Customers in video stores should have online access to the archive's homepage with film search facilities. Staff in video stores could be part of the consultants' network and provide information about popularity and trends in the video stores.

7. Search strategies

A wide range of search options should be available and a collaboratory should support strategies that are preferred by the actors in the archive:

- Analytic search strategy

- Empirical search strategy
- Browsing strategy
- Search by analogy
- Bibliographic search strategy

8. Collaboration

The collaboratory should have links to the staff of the archive and all the experts that are collaborators of the archive. This requires a standardised scheme that can be used to classify the important features of the experts working in topics that are relevant, for example, for the information retrieval and cataloging functions of the archive. A scheme is also required to make compatible and relevant information available about the experts in institutions. This will help the process of teaching novices about the expertise of all their colleagues, it will help experts to remember experts by browsing, and finally, it will be very important for a web based collaboration with other institutions in Austria and internationally.

9. Users' web access to the archive's material, services and staff

The following recommendations on users' web access to the archive predominantly reflect recommendations from the respondents. The purpose is to make FAA more internationally visible, to extend the work of collaboration, to attract more users and save time by dividing the work among users and the staff.

An Internet database and web site should be available to make it clear what kind of questions the archive can answer for the user. It should help users get an overview of what is in the archive, give a presentation of all the services that the archive offers and show short presentations of the material that is available. It should create awareness of what the special services and expertise of the archive are.

Simple information needs like finding a specific film or book should be a self-service activity conducted by the user through a web catalogue with public access to the common database. Personal contact and face- to face communication should be isolated to the users with complex and special information needs or novice users, who are unfamiliar with the film domain.

For an effective search result, it is necessary to ensure that the user request is as specific as possible. Developments of different thesauri, either created according to standard models for thesaurus construction, or on the basis of empirical warrant in users' need formulations, for instance, a word association thesaurus, can assist users in browsing and exploring knowledge domains as aids in identification of needs and query formulation (Pejtersen, 1991).

A function that supports the filtering of information in the collaboratory would be useful. For example of the users' requests, if the user cannot find the information by searching themselves. Either by giving the user the control and possibility for choosing domain experts and the relevant institutions by making such information visible to the user; or by directing the queries to the proper domain expert and/or institution.

Users' film knowledge may be taken advantage of in a proactive collaboratory. For example, easier localisation of materials through automatic request facilities and through end-users' input, for instance comments like: I have a copy of that film at home. Interaction with users will provide current awareness of research and film production, for example through an incremental approach towards end-user annotation of contents. Users can add information about persons in the collaboratory that will make it easier to gather information about persons involved in film production.

Access to bookstores and video stores on the web that enables immediate purchase to cover a user need where no information exists.

Web based links to all the institutions with which the archive collaborates in order to supports communication and coordination of work.

The archive receives many questions of similar characteristics. Based on this fact it would expedite the answering of these requests if the collaboratory contained a collection of standard answers to these frequent requests, for example as FAQ (Frequently Asked Questions) webpages to which the staff could provide links. The standard answers should be available for linking, cutting, and pasting so that

they could be incorporated freely in answers, which contained more than just the standard formulations.

10. Current value added information

Apart from the cataloging work, FAA's commercial activities have also contributed to the development of keywords by a bottom - up method. Video involves the time-consuming process of watching original films in order to identify content. In certain cases this is straightforward, where the theme of the video is based on a specific year. It is more difficult, however, if the theme is more diffuse and demands that excerpts be extracted from films covering an extended time-span. These and similar activities in the archive should be coordinated when building a collaboratory.

8 Work in NFA archive

The Národní Filmovy Archive (NFA) is located in Prague and has a repository outside Prague. The archive is the national film archive of the Czech Republic and was founded in 1943. The archive is partly funded by the Czech government and partly by the archive's own activities. The archive has about 100 employees and is divided in the following departments: administration, library, film archive, documentation, film history, IT, yearbook production and restoration/preservation department. The collections consist of films, clippings, microfilms, film magazines, stills, negatives, film programs, rarities, posters, books and newsreels. NFA is a member of FIAF and participates in international projects.

8.1 The work domain

Goals	Preserve and produce artefacts of cultural heritage. Collect, archive, preserve and restore all film-related materials relevant for the Czech Republic. Ensure commercial viability, via exploitation of materials owned by NFA. National and international collaboration with archives and other professional institutions in and out of film domain. Develop international awareness of Czech film culture. Acquisition of new materials.
Constraints	Obliged to hold all films released in Czech Republic. International code of practice for cataloging. All income beyond 28% provided by state must be generated by NFA itself. Ownership of rights restricts commercial exploitation of archive information content. Annual audit by Ministry of Culture. Acquisition criteria.
Priorities	Catalog all materials. Dedication to the archiving process. Production of documentary records. Production of good scientific work. Preservation and restoration of disappearing knowledge – that may be found on vulnerable film material or in memories of elderly people. Broaden appreciation for singularity of NFA collection.
Functions	Accept and process new materials as determined by legal status, acquire new materials based on archive's own agenda, identify materials acquired from private collections and foreign film archives, co-produce weekly television programme - 'Searching for Lost Times', produce documentary records of the present on 35mm, film interviews for oral history project, transfer nitrate film to safety stock, de-mould film materials, input information in databases, develop and implement new IT resources, restore posters/photographs, scan posters/stills, publishing activities, yearbook, Czech filmography, Iluminace (quarterly) and Film Review (monthly), film books, collect material from amateur filmmakers, organisation of retrospectives nationally and internationally, participate in international film festivals, research/publications on history of Czech animation, history of Czech films for children, film history, lecture series on history of cinematography, development of medium and long-term strategy, classify new film materials according to 'in-house' colour scheme, maintain continuous contact with Czech television companies, participate in FIAF events, fortnightly meetings with seven heads of department and archive director.
Work Processes	Two groups meet weekly to watch films with view to identification (directors, producers, cinematographers, screenplay authors, actors) and cataloging (genre, storyline, notable features), communication between three sites; via face-to-face contact, telephone, fax, and partial email, cut, edit, and restore film material, restore and scan posters, identify and label new material, input information to database.
Physical Objects	Full length feature and short films, masters, print and negatives, videocassettes, books, journals, magazines, film scripts, digital laboratory, personal computers, scanner and colour printer, restoration equipment, workbenches and special chemicals, editing equipment, cinema, film projector.

Figure 8.1: Means-ends abstraction hierarchy

8.1.1 Main goals and strategies

The goals of NFA reflect much about the history of this institution. Founded in 1943 it is one of the largest film archives in the world and already undertook membership of FIAF in 1946. The archive has survived much social upheaval since its inception and for these reasons the information content of the archive has not always been managed well. In 1993 the NFA acquired its status as a national archive. This meant more attention was given to the work of cataloging materials and to the work of preservation and restoration. Its status as a national archive is also reflected in the work NFA does with cultural heritage. This, in turn, reflects the fact that the Czech Republic has historically accorded filmmaking a high cultural value. The aim of acquiring work from amateur filmmakers reflects both of these points; amateur films being considered part of cultural heritage, while the number of amateur filmmakers points to importance of filmmaking in the Czech Republic.

The international outlook of NFA is witnessed in its early participation in FIAF. Aside from the opportunities afforded through membership of FIAF there are also certain conditions that must be adhered to. This entails that NFA follow established criteria for cataloging materials and is bound to a code of ethics, which stipulates, for example, that long-term care of material should not be sacrificed for short-term exploitation. These constraints are, however, the basis upon which international collaboration and the pooling of resources can be conducted in a climate of mutual trust.

The time and resources that NFA dedicates to its own film activities is indicative of its need to generate roughly three quarters of the archive's annual budget. The value attached to cultural heritage is also evinced in this activity. The two on-going film projects conducted by NFA are concerned with preserving cultural heritage of the past and recording cultural heritage for the future. The weekly television show that provides information about the history of Czechoslovakia based on the NFA film collections has also proved to be a good source of information. NFA receives frequent correspondence from viewers who have seen some item on the show and are able to provide further information otherwise unavailable to the archive.

A similar motivation and similar outcome can also be identified in the other publishing activities undertaken at NFA. The current director of NFA identified that there was a need to produce a Czech filmography for the Twentieth century in the mid 90's. This was clearly a difficult task but it was deemed necessary if the NFA wished to fulfil its aspiration of being an archive of international standing. Subsequent to the publication of the first volume NFA received various feedbacks some of which provided the archive with knowledge about films that it was assumed were totally lost.

8.1.2 Constraints

As mentioned above although membership of FIAF is consistent with NFA's interest in international exposure it also entails following codes of practice determined outside of the archive. This is most apparent in the restrictions regarding the commercial exploitation of archive resources. In addition to the priority given to the safety of material owned by the archive there is a strict code of conduct regarding how exploitation activities should be conducted. First and foremost archives are required to respect the rights of those who own copyrights to material the archive uses. Furthermore, it is specified that all screenings organised by an archive must be based on a cultural and/or educational framework. Most significantly, all screenings organised by an archive must be based on a non-profit principle.

Although the NFA is now more independent from state authorities than has been the case in the past it remains necessary to submit an annual report to the Czech Ministry of Culture. Even though the archive now generates much of its own income it is still required to account for the way in which it has used resources and this is what the ministry look at in the annual report. Resources, or the lack thereof, are clearly an issue for archive staff, but this should be considered against the background of the NFA's very broad range of activities.

Even though NFA has, among the three archives, the most sophisticated system for accessing its information content there are a number of constraints that this imposes. The primary concern is the fact that the databases (film materials, stills and posters, new Czech film and video production Yearbook and library) established in the archive are in no way integrated. It can be debated whether such integration is needed for the majority of the tasks currently performed in the archive, but the lack of integration provides obvious obstacles to conducting cross-referenced searches across different

media. This also entails that there is little rationalisation and a deal of redundancy in inputting information to these systems.

A final obstacle to communication is language. This is most relevant to a project such as COLLATE where multi-national teams must collaborate in a common language. This problem is arguably compounded when the participating countries do not share a common alphabet. Leaving aside technical issues related to this problem it is also the case that there may be more immediate and practical problems in relation to communication among colleagues based in different countries. Due to the circumstances of its recent history the Czech Republic has not been nearly as exposed to English, as is the case in the other archives. At present, however, the fact that only a minority of staff at NFA are able to communicate in English fits with the organisation of this work domain. Although this might present problems in the future, if the Collaboratory were to develop, it is also the case that many staff at NFA are currently undertaking English lessons and the obstacles in this respect should soon be overcome.

8.1.3 Priorities

When the present director of NFA joined the archive in the 1960's very little of the information content was cataloged. Neither had any thought been given to the storage of materials, that is, no thought had been given to the conditions in which materials were stored. It was difficult, therefore, to actually locate the information content of the archive and once located there was a risk that the material would be in no fit state to use. With this in mind the current director has striven throughout his career to prioritise the preservation of NFA's collection while at same time leading a drive toward the cataloging of all materials. In his view this is the foundation on which all of the other activities undertaken by the archive must be based. This contrasts with the previous philosophy of the organisation in which priority was given to the publishing activity.

Amongst the very good reasons for preserving the NFA collection is the fact that it contains two thirds of all silent film ever made in the Czech Republic. As such it is unique in an international context. This is one of the resources that the archive uses in its efforts to attract attention to itself from national and international audiences. That the majority of Czech films from the silent period still survive says something of the value attached to film here and this is also reflected in the desire to spread awareness of NFA's resources through various dissemination activities. The pride in Czech filmmaking continues to be pursued today via collaboration with contemporary filmmakers. This can range from providing material from the archive, such as newsreel footage, to giving information about the kind of clothes that would have been worn in, say, the 1920's.

As well as working with other filmmakers the NFA's own film production is an important part of the work conducted within the archive. In the case of 'documentaries of the present' the aim appears to take over the function that was historically served by newsreels. Although the focus of these films is not exclusively on cultural matters it is the case that they explicitly address an agenda based on specific cultural values. Foremost here is the notion of recording the present so that it will be available to future generations. It is the permanence of such records that is prioritised here and this accounts for why these documentaries are made on expensive 35mm film. Initially the NFA's 'oral history' project only covered the history of cinematography and as such focussed on individuals who were directly or indirectly involved in Czech film production. Today the focus is much broader and interviews are conducted with people from various backgrounds and cover a wide variety of topics. Although the focus of these 'oral histories' is now wider, NFA prefers to restrict the age range of those they interview; it being considered desirable to talk with people in their sixties and seventies. This is because they are more likely to have sharp minds than, with some notable exceptions, those in their eighties and nineties. The imperative to collect and preserve, which is seen in other areas of archive activity, is applied to people and culture in this context.

A concern with disappearing knowledge is also witnessed in the work done on preservation and restoration of film materials. In certain respects this work prioritises itself; nitrate stock is known to be very vulnerable and where material has begun to mould the problem is already pressing. It is for this reason that much time and effort is given over to transferring nitrate stock over to a safer and more durable material and to the work of de-moulding film.

Finally, NFA has also prioritised the acquisition of new material. So aside from the material it receives, as of right, as a national archive it goes to some lengths to obtain extra material that will enhance the

quality of the archive. One example of this is in the area of amateur film and the archive has conducted a concerted campaign to obtain such material. Since this project relies on the cooperation of the public it is important to raise the profile of the archive. The weekly television programme that provides, amongst other things, information about NFA activities is ideally suited for this purpose.

8.1.4 Work functions

The aim of the analysis of work functions at NFA is to understand the way in which goals, constraints and priorities are executed in different functions, and how they relate to the different functions. It is also necessary to understand how these functions are interrelated. The analysis of work functions at NFA breaks down different activities into functional units. Although these do not always directly match actual departments in the archive they are broadly reflective of the different areas of work that are undertaken.

8.1.4.1 Information seeking services

Aims

Although NFA provides various user services, it is the library where the majority of face-to-face interaction with users takes place. Indeed while most users who visit the library are interested in accessing its collection of books, journals, magazines and film scripts it is also the case that the library sometimes serves as a general access point to NFA's information content. Users who come to the library with requests pertaining to film material, posters or stills will be referred to the relevant part of the archive which they then must visit in person.

Within the library there are two staff members dedicated to helping users find the material they require. This is necessary because it is often not possible for users to access the library database personally and, apart from the material stored in the reading room, browsing the library collection is also out of bounds. That this is so reflects the limitations of the library database, which is too complex for novice users, and the lack of physical space. Both these factors are pertinent to the library's long-term goal of allowing users the possibility of accessing the database from their homes via the Internet.

Information retrieval

The most obvious information retrieval task within the library is connected to the requests obtained from users who come to the library in person. While two members of staff ostensibly handle this, others must assist these two individuals when it comes to locating materials. The library also provides user services to other members of NFA; those involved in the production of the yearbook, for example, obtain much of their primary data from sources that the library has the best access to. Likewise there are frequent requests from other institutions, both inside and outside the Czech Republic, which exchange information with NFA on a regular basis. The NFA library must also obtain information that will enable it to maintain and enhance the quality of its collection. At present one priority in this respect relates to the completion of the archive's collection of Czech film scripts. Finally, the library is currently engaged in the process of adopting a new database and all the information retrieval activity incumbent upon this work.

Information needs

As elsewhere the main need of the NFA library relates to its own information content. This is important for user services though, in light NFA's goal and strategies, just as important is the principle of rigorous scientific cataloging. One need, therefore, is for familiarity with the cataloging standards established by FIAF (See Harrison, 1991). It is also important to know how FIAF subject categories should be translated in Czech and what degree of consistency there is throughout the archive regarding this. Familiarity with the library collection is also important since, due to the lack of available space, eighty percent of the collection is held in the NFA depository outside Prague. As the library acquires many new books etc. in the course of one year there is a constant need to consider which material can safely be moved off-site. The information need here concerns how popular the material is with users, whether old material is made redundant by new acquisitions and if there are special features to otherwise outdated material that make it important to keep within the main collection. It follows that it is also

important to know what new material is available and whether it provides added-value to the existing collection.

Information sources and tools

Access to the library's information content is managed via an electronic database. This does not include information about foreign films, actors and directors, however, which is currently stored on a card index. In addition to these resources the expertise of library staff, especially their familiarity with the collection, sometimes serves to shortcut the retrieval process. This also applies to NFA staff outside the library whose expertise is recognised when it is necessary to refer a user to another part of the archive. The fortnightly management meeting, which the head of the library attends, is one of the forums through which this mutual familiarity is achieved. It is the responsibility of all heads of department to ensure that those working under them are informed about NFA's activities. Through its links with similar institutions, both inside and outside the Czech Republic, the NFA library is able to draw on a body of knowledge and information beyond its own. The Czech national library is one of the institutions that the NFA library works closely with and is also the source for all information relating to forthcoming publication in the Czech Republic. The NFA library receives this information in the form of a list, which is distributed once every two weeks.

8.1.4.2 Preservation and restoration

Aims

The work of preservation and restoration is highly valued at NFA and considerable resources are accordingly devoted to these activities. This is especially the case in relation to film material, though recent years have also seen work on the preservation and restoration of film posters and stills being undertaken. Much valued as this work is it is also the case that NFA, like any film archive registered with FIAF, is obliged to undertake these activities. In fact NFA does far more than that which is simply required; a fact that reflects both the size of the collection and the years of neglect to which it was subject.

Information retrieval

Last year NFA transferred 49,497 meters of nitrate films to safety stock and removed mould from 128,762 meters of film. This gives an indication of the scale of the task with which NFA is confronted. In light of this and the fact that the longer these materials are untouched the greater the risk, it is clearly important that the staff is able to easily locate and access the material. In respect of preservation there would appear to be less information retrieval work required. It is essential that the collection is continually assessed; especially important for materials potentially at risk. In more proactive vein NFA's efforts at gathering material from private collectors and amateur filmmakers is also aimed at ensuring this will be preserved for future generations.

Information needs

Given the fact that NFA manages a large collection and that much of this material is very old it is important that they are able to identify which material is most urgently in need of attention. This will largely be determined by the physical condition of the material but other factors, such as historical significance or rarity, will also play a role when it comes to prioritising one film above another. As this indicates it is more than technical information that is at stake in this process. This is also true for restoration work since, in order to restore a film, background knowledge about the film, the period in which it was made and the career of its director may all contribute to the decisions that need to be taken. Familiarity with similar work in other archives is, for various reasons, also necessary. This is especially true for restoration work, as it may not be desirable to expand resources on a film that has been well restored elsewhere. The work of others may also be a source of inspiration, in the strategies, for example, they apply to common technical problems. Finally, there is also a need to keep up with technical developments in the field of preservation and restoration.

Information sources and tools

In order that film material can be easily identified NFA has adopted a colour coding system. All film materials are marked according to the material on which they are stored e.g. nitrate and according to the status of the copy e.g. master, print, negative. This scheme is applied throughout the archive and allows easier and speedier access to the collection. It also serves as a mechanism for identifying materials that are out of place. As technical work cannot be conducted in isolation the technical staff at NFA work very closely with colleagues who specialise in the study of film history. It is necessary to have more than technical staff since it is NFA's strategy to obtain as much historical information about and around a film when undertaking restoration work.

It is also important to know about the collections of other archives as restoration may require that missing sections are replaced by copies from other versions of the same film. In this case it is important to know where to find other versions, what condition they are in and which would be the most appropriate to the restoration project. The network provided by affiliation to FIAF is helpful in this regard.

The collaboration between technical staff and those in film history is also important in the classification of new material. When obtaining new material it is necessary to assess its condition and evaluate what should be done with it and where it should be stored. The very best way to do this is by watching the films and NFA's weekly film commissions serve this purpose. Here staff from different departments watch films and assess their quality according to criteria most relevant to their area of expertise. This forum also allows the possibility of technical quality control, when staff watches films that are already part of the archive's collection.

When new material is acquired it is first processed through the technical department. Staff here will then assess its quality and fill out a form, attached to all NFA material, which indicates on a scale of 1-4 what condition the film is in. It is necessary to isolate and process new materials in this way since there is a risk that any bacteria they carry could infect other films once they are together with the bulk of the NFA collection.

Since NFA adopt a proactive approach to the work of preservation it has proved significant that they produce a weekly television show. This serves as an effective tool by which to tap the enormous resources of information that is in the possession of the general public.

8.1.4.3 Production and sales of products

Aims

Quite soon after the fall of Soviet rule in Czechoslovakia the NFA inherited the right to manage access to its information content. Given the quantity of material and the fact that it was in high demand, the NFA developed its own production company for this purpose. It is through this organ that all arrangements are made regarding commercial showing of NFA material. One of the most active collaborations here is with the broadcasting companies in the Czech Republic. Production at NFA has gone further than this, of course, and involves documentaries, television shows and various written publications. Although NFA has a right to use the material in their protection it is not always the case that they directly profit from this. They are constrained by national laws, copyright restrictions and the FIAF code of ethics.

Information retrieval

The variety of different production activities undertaken at NFA is underpinned by a wide-range of information retrieval tasks. This is especially true for written publications; the Czech film yearbook and filmographies, but also applies to the organisation of retrospectives and documentaries of the present. The Yearbook of Czech film is, arguably, the most demanding given its objective to provide information about every company involved in Czech film production.

Information needs

Given the numerous activities that are covered in this section there are also numerous and diffuse needs to consider. One common need throughout, of course, is for quick and effective access to

reliable sources of information. In certain circumstances reliability is not a problem as the information provider will be the archive itself. This is true of the television programme but also applies to the Czech filmography that, aside from being an important resource in itself, has indirectly contributed to NFA developing its own filmographic database. In other circumstances the need is for information that can only be obtained outside of the archive, as is mostly the case with the Yearbook and NFA's 'documentaries of the present'. In relation to the latter, the goal of creating a historical record of the present requires knowledge of important events and people as well as the means to obtain access to them. This is also true, to a lesser extent, for the oral histories that the NFA strives to document.

Information sources and tools

When it comes to obtaining information the NFA is in the fortunate position of being a nationally recognised institution and as such is able to draw on a wide-range of sources. The influence of NFA is also seen in the close working relationship it has with broadcasting companies, some of whom are in almost daily contact with the archive. In other areas it is necessary for NFA to take a more proactive approach, as is the case in the production of the yearbook. At the early stages it is the archive that provides staff who work on the Yearbook with some of the basic information they need; that is, information about every firm, from production companies to caterers, which has been involved at some level with Czech film production in the preceding year. Subsequently the Yearbook staff distributes a questionnaire to all of the relevant firms requesting supplementary information and on the basis of this the Yearbook is produced. To some extent the work done at NFA on retrospectives can, contingent on the subject matter, only be done by accessing external information sources. Again membership of FIAF is a great boon in this context, especially for the way in which it encourages networking among film archives from around the world.

There were no explicit mechanisms for assessing the success of retrospective seasons, however, possibly highlighting the emphasis on artistic rather than commercial criteria at NFA. Unfortunately our data does not allow us to consider what is involved in the publication of a quarterly journal for film theory, history, and aesthetics (Illuminace) and a monthly film review about film and videoprogrammes distributed in the Czech Republic.

8.1.4.4 Research

Aims

In previous years conducting scientific research was prioritised above all other activities at NFA; so much so that it meant the archive's collection was more or less neglected. As this indicates the archive and the research that was conducted under its auspices were scarcely related; the majority of written work concerned with film theory and aesthetics more than anything connected to the practical business of operating a film archive. Research continues to be an significant activity at NFA today but it is no longer the case that research and the activities of the archive can be thought of as separate domains. Now all research connected to NFA has a basis in the practical issues which emerge from running a film archive. By way of example the theory and history of film are now followed as much for how they can inform the development of the NFA collection, vis-à-vis new acquisitions, as they are for serving to identify interesting research topics. In similar vein, while there is much basic research at NFA, which contributes to the Czech filmography and the Yearbook for example, this is always cast into the broader perspective of developing the archive as an information resource.

Information retrieval

As the majority of research work at NFA is problem driven, information retrieval will tend to be task rather than domain specific. Of course staff involved in research related work are expected to have an extensive knowledge around the theory and history of film and are, therefore, bound to maintain this knowledge in light of new developments. Nonetheless, the majority of their time will be spent looking for information relevant to specific projects being conducted at NFA. As these projects will involve staff from other areas of the archive a good deal of information exchange will be involved. Research staff are also responsible for overseeing the acquisition of new material and in particular, since all Czech films are acquired as of right, the acquisition of foreign films.

Information needs

It is important for NFA staff that they keep abreast of contemporary development in film theory and history. Such knowledge continues to be crucial in the work they do, for example in informing the decisions they make regarding the acquisition of new materials. Given the role that staff in this area has as an information resource for the whole archive it is also vital that they are aware of work in other archives. Staff in this area also act, in the words of NFA's director, "as our flag in the outside world"; a point that indicates their role as the access point to all parts of NFA outside of the library. That they should have this role is based on their perceived ability to interpret, on the basis of their extensive knowledge, user requests and direct the users to the person or place where they will most likely find what they are after. Because they are constantly collaborating with other areas of the archive they are also likely to have the most elaborate overview of NFA and the people within it.

Information sources and tools

Watching films is vital work and precisely why NFA attaches so much importance to its weekly screenings. Both films and books are certainly important when it comes to providing input for the technical staff in their work on restoration. The primacy of films and books is also apparent in the proposals for new acquisitions. The reason for this is that NFA must be very selective when it comes to acquiring new material and as such they follow fairly strict criteria regarding new acquisitions.

8.1.5 Work processes

User requests are processed, often via management, and distributed to the people within the archive who are deemed best equipped to deal with the particular inquiry. Formal decision making within the archive is established in fortnightly management meetings and in more frequent and informal meetings within the various departments. Collective work among the departments, for instance cataloging and new acquisitions, is facilitated by group screenings of films that take place twice a week at the archive's small on-site cinema. Staff watches films here with a specific task in mind and at the end of the film there is a detailed discussion based on the work objective at hand.

8.1.6 Configuration, objects and tools

There are several electronic databases within NFA, each covering a different aspect of the archive's information content and each with its own possibilities and constraints in terms of search fields. The *database of film materials* is structured according to categories of film; feature film, documentary, animation, newsreels etc. For Czech films up to eighty different filmographic fields can be filled in whereas only twenty-two are possible for foreign films. In the *database of stills and posters* there is basic filmographic information about films as well as information concerning technical details; what condition it is in, how it is preserved, if it has been scanned etc. The data in this database has been extracted from the database of film materials. In the *database of the Yearbook* all information that has been gathered in the nine years of its publication is stored. Finally there is the *database of the library* that covers all of the archives information content held in books, magazines, journals and film-scripts.

At present it is only the library database that can be used by end-users. This is now being replaced by what is intended to be a more user-friendly system that will overcome some of the accessibility problems encountered with the current version. The remaining three databases are only available for staff use and this, in turn, is restricted to those who have access, via a PC, and the right to use these systems. The library reading room and the archive's small cinema also facilitate access to NFA information content. A web page to communicate the archive's presence and the resources it has available is currently under construction.

The archive's email system has recently been extended to provide every staff member with a personal email address.

8.2 Actors

There are over one hundred people employed at NFA and consequently a range of different personal and professional backgrounds. The majority of staff are well educated, many with university degrees and this education plays a direct role in what they are employed to do. Thus in the archive and records department there is a preponderance of people with training in information science, in film history a large number with backgrounds in film and drama studies and social history, whereas in preservation and restoration more staff have training in the natural sciences. In addition to the range of educational backgrounds there are great differences in levels of experience. A significant core of senior staff has held permanent positions at the archive for twenty years or more whereas there are also many novices recently appointed at the archive on temporary positions in project related work. With the exception of NFA's director, all members of staff are located in one of the archive's seven departments and an individual's tasks will remain bound up with the department to which s/he is affiliated.

8.3 Work organisation

The social organisation of work at NFA is structured according to the seven departments of which the archive is comprised. All formal communication between these departments takes place at fortnightly management meetings in which heads of department meet with NFA's director to discuss plans for immediate and more long-term work. It is the responsibility of each department head to relay the outcome of these meetings to staff for whom they are responsible. This is achieved in both formal meetings and through informal interaction. Formal meetings within the departments also serve as the forum in which proposals to the management group are considered and formulated. As this suggests decision-making within NFA is hierarchical. Apart from users who use the library, and these are mostly students, information requests made to the archive are received by the secretary's office and – when it is clear who would be best suited to answer the request – forwarded to the appropriate staff member. Although a small number of staff works across the three different sites of the archive and thereby serve as mediators, telephone and fax, as opposed to email, are the most common means by which messages are exchanged among the three different locations.

8.4 Collaborative cataloging, classification and indexing task situation

Cataloging tasks at NFA are directed to a number of different media, including films, books and journals. A highly important cataloging task focuses on the production of the Czech national filmography, involving collaboration between cataloging experts in NFA as well as collaboration with experts outside NFA. The cataloging medium applied is a database system that is accessible in the local network environment. The following section explains the different levels of task decisions involved, together with the strategies and collaboration forms applied.

Filmography

NFA is responsible for the production of the Czech national filmography. The filmography is cumulated as follows:

- Czech Feature Film I, 1898-1930
- Czech Feature Film II, 1930-1945

Two additional cumulated filmographies are planned for publication:

- Czech Feature Film 1945-1970
- Czech Feature Film 1970-1992

Following the publication of the new filmographies, a CD-ROM of Czech Feature Film, covering the period of 1998-1992, is planned for publication as well. Each filmography is published in Czech as well as English.

The objectives of the Czech national filmography is to document research results by NFA and its collaborating national partners (universities, national experts, etc.) on Czech film history. Thus, the

overall goals of the filmography are related to a historical, documentary interest. Additional objectives include cultural mediation and dissemination of Czech film production at a national as well as international level. Therefore the primary target groups for the filmography are researchers, film students and film archivists. Important secondary target groups include film distributors, educators and other cultural mediators.

The filmography is available in printed form. In addition, it is available in machine-readable form at NFA, using the Access relational database system for cataloging and retrieval. The database is at present only available for the staff at NFA, and search requests by users are filtered by the director and delegated to NFA staff. Staff members function as consultants for the users and assist them in formulating search problems and suggest solutions from the NFA database and collections.

The expertise of the filmography staff is related to:

- Types of film materials and their associated socio-historical and technical (production) contexts
- The historical and socio-cultural knowledge and the aesthetic experience that the films document and mediate
- Types of user requests to the databases and collections
- Cataloging and indexing rules (FIAF standard)
- Information seeking strategies and processes

Database management is coordinated and performed by NFA's database administrator. His tasks include metadata management i.e. control and update of controlled indexing language and classification codes for different types of materials. At present, the controlled indexing language is available as alphabetically ordered lists of indexing terms and codes. The controlled indexing terms are applied for searching in NFA's database, as well as for compilation of back-of-the book indices to the printed versions of the filmography.

8.5 Collaborative cataloging, classification and indexing decisions

Filmography production at NFA involves a number of task decisions for the staff involved, ranging from relevance assessment and subject analysis to entering filmographic data. It also involves a number of task decisions about the publication itself, for instance proof-reading of a galley proof manuscript, retro-indexing and -cataloging in the filmography database in order to correct and expand some of the entries, and finalising layout and content of the product.

The following decision task analysis builds on interviews with archivists at NFA on their collaborative filmography work. Furthermore, it builds on an interpretation of their applied format for film description (Opela et al, 1998; Harrison, 1991), as viewed in the perspective of Pejtersen's generic means-ends model for analysis, indexing and cataloging of fiction narratives (Pejtersen, 1994). Pejtersen's model reflects the overall abstraction levels involved in subject retrieval of fiction. These levels address the contents of the fiction narratives, for instance overall theme, main characters, time and place, as well as their different intentions and potentials for use, ranging from intentions to mediate emotional and aesthetic experience to potentials for cultural and historical mediation. Figure 8.2 is a mapping of Pejtersen's model to the current approach of film analysis and cataloging for the Czech filmography. The data fields applied in the film cataloging format are inserted and emphasised as ***italic/bold*** within each dimension of figure 8.2. The dimensions/levels are: 1. Originators' goals and values. 2. General and specific content in film. 3. Communication and presentation of film format. 4. Filmography attributes. 5. Archive attributes. 6. Distribution, provenance, mediation. Through this mapping of NFA's approach to film analysis and description and Pejtersen's model it was possible to break down the complexity of decision levels involved in collaborative filmography work, ranging from relevance assessment to entering filmographic data. The model has six levels.

Originator's intentions and goals

Levels 1-2 correspond to high level interpretation and task decisions. An important coordination event for levels 1-2 is a weekly screening of films. At NFA, levels 1-2 are addressed in collaboration with national film experts outside NFA, involving a high degree of coordination activities and consulting of local experts as well.

Levels 3-6 correspond to more "low level"/ad hoc task decisions, such as information gathering, checking up on secondary (written sources), decisions on attributes to be applied and data entry tasks. Levels 3-6 include collaboration and contact with external partners and persons as well as internal coordination among staff. An important coordination mechanism for levels 3-6 is the local application of the FIAF standard for cataloging and indexing, and its associated data entry format (See Harrison, 1991).

The following task decision analysis focuses on levels 1-2, 4 and 6 and addresses the first part of filmography production: analysis, indexing and cataloging.

Task decisions and collaborative contexts

Collaboration occurs at all levels of filmographic work. For collaboration on tasks related to levels 1-2 of the above model, an important performance criterion is to reach a relative *consensus* on the contents of a film. This performance criterion is met through interacting with and eliciting knowledge from other experts, and writing up and sharing notes and secondary literature about the film content, for instance at the weekly screening meetings. Furthermore, an important performance criterion at this stage is to address *diversity of viewpoints* on the contents and use of the film. This latter criterion is important in order to ensure that each film is analysed for its assumed target groups and knowledge interests, as well as according to its past and current cultural-historical contexts. Both performance criteria are important in order to meet the overall goals of NFA of cultural mediation, research and education.

At levels 3-6, on the other hand, the purpose of collaboration is to support the performance criterion of *correctness* of filmographic entries and data. This implies two very different forms of collaboration, and hence, possible role allocations for cataloging staff at NFA. Collaboration at levels 1-2 requires extensive domain expertise in the film area as well as experience and knowledge of the target groups for the films, represented by the members of the national film committee. Collaboration at levels 3-6 calls for a large network of colleagues within and outside NFA. In addition, experience with the FIAF cataloging rules is required.

1. Originators' goals and values	
Why?	*(1) Originators' intentions and goals:* Communication of information; education; promotion and stimulation of ideas and emotional, socio-cultural and aesthetic experience etc. ***Literary model(novel, novella, short story, theatre play*** *Contraints*: ***censorship,*** production means (budgets, locations, staff et.)
Why?	*(2) Originators' affiliation and attitude:* Professional paradigms (narrative/aesthetic style, form, etc.) and their socio-historical context, political and cultural movements, or other value criteria Constraints: socio-cultural backgrounds, target groups etc.; ***censorship***
2. General and specific content in film	
When?	*(3) General frame/time content:* Time, year, historical period etc. Temporal aspects of the topic
Where?	*(4) General frame/place content:* Place and setting, geographical, historical, socio-cultural contexts of the topic

What?	*(5) Subject matter content:* Specific topic and plots; psychological and social phenomena; ending of film; ***Contents (abstract of film), keywords (indexing terms), annotations***
Who?	*(6) Living beings, institutions and artefacts:* Main characters, persons, animals, plants, institutions that are involved in the topic, and their important attributes etc. ***Music and songs (composers, titles), cast (names)***
3. Communication and presentation of film format	
How?	*(7) Film types and formats:* ***Types of film materials***, 'inter-textual' phenomena ("citation" or applications of clips from other films/art works/documentaries), etc.
How?	*(8) Accessibility level:* ***Censorship documentation/cards, contemporary documentation, sources, bibliography (reviews etc.),, indexes***
How?	*(9) Physical characteristics:* ***Sound systems,*** etc.
4. Filmography attributes	
Who?	*(10) Filmographic data and identification numbers:* ***Film titles, names of director, assistant director, story, screenplay, director of photography, set designer, art director, costume designer, editor, sound, introductory title designer, production manager.***
Where?	***Locations***
When?	***Year of production***, version etc.
What?	Type of material
How?	Size and format etc.
5. Archive attributes	
Why?	*(11) Archive goals and policies* *(12) Local archival conditions:* Shelving, storage
When?	Preservation, restoration, sales and lending of films and videos
6. "Distribution", provenance, mediation	
Why?	*(13) Distributors', donators' etc. goals and policies:* ***Name of first distributor***
Where?	(14) ***Production and film studios***
When?	(15) ***Premieres (dates), awards***

Figure 8.2: Means-ends model for film analysis, content description and cataloging ; Italic/bold = attribute expression, applied in NFA filmography.

Relevance assessment (level 1)

This task decision is an interpretative process, requiring a high degree of domain knowledge and involving collaboration with internal and external domain experts. The task decision begins with a screening meeting, involving both internal and external experts where the contents and possible target groups etc. for the film are discussed. During such screening meetings, experts contribute with information about accurate titles for films, film studios, locations, directors, literary model and so on. Following this analysis of the film as a primary source, the filmographers complement the information from secondary sources such as censorship documents, screenplays and film journals.

Subject analysis, indexing and content description (level 2)

This task decision involves:

1. Expressing the content of the film in a written abstractor annotation, providing the reader with an overall idea about the main theme, plot and main characters of the film.

2. Articulating the subjects of the film, using NFA's standard indexing terms and codes.

These task decisions iterate with the task decisions of relevance assessment as well as decisions on updating NFA's controlled indexing language. For each new film, it is decided if new indexing terms or codes may be warranted in order to express new kinds of subjects in the film from the filmographer's as well as from the assumed target groups' points of view.

Collaboration on this task decision occurs at the screening meetings. Furthermore, NFA's filmographers have a close day-to-day collaboration, where they function as consultants for each other.

Planning filmographic entries (level 3-6)

This task decision concerns decisions on what attributes of the FIAF/NFA format to apply for cataloging entry (title, literary model, etc.). Some fields of the format are mandatory, whereas the remaining fields are optional.

Entering filmographic data

This phase covers a number of processes:

- Get an empty record, select fields for expressing decided attributes of film
- Consult term/code lists, associated with existing attributes in filmography database, enter film description data from lists, or type new data
- If galley proofs are returned to a filmographer from proof-reading and indicates amendments, retro-cataloging and -indexing takes place in a record already existing in the database

Finishing filmographic record

Save new or revised record in database, check update of database.

8.6 Needs arisen from the work analysis of NFA

According to the field studies of archive work conducted so far, a shared virtual collaboratory on the web should be based on the needs presented below. A collaboratory should also support the existing collaboration within the archive and with professional networks outside the archive.The purpose of this analysis and the subsequent recommendations is to provide a source that can inspire the requirements for the COLLATE Collaboratory. These are ideas for ways in which the current way of working combined with new opportunities may help in accomplishing the goals and work activities of the archive.

1. Content access to NFA collections

Access to NFA’s information content is a condition for a successful collaboratory and access to NFA’s information content will be dependent on the information sources that the collaboratory can provide. At present it appears that the COLLATE system, drawing on existing resources within NFA, will be equipped to access information content. It will not, however, be able to search across different

information media e.g. film, books, posters, stills etc. The quality of information will also vary according to the media on which it is stored and what the database can extract from the information content. For a number of the current work tasks undertaken at NFA, for example restoration and preservation, information is required from more than one database. An information source that could provide a more unified way of accessing the contents of the collections would be valuable for such tasks.

2. Content access to people

Mediation is an extremely important activity at NFA; both bewtween staff and users and amongst the staff. There are different reasons for this but a common factor in it is that people use each other as points of access to the vast information content of the archive. In relation to mediation between staff and users this is partly an outcome of users having restricted access to the information sources of NFA. From our field studies there appeared to be little interest, outside of the library, for providing users with more direct access to information content. At present, however, NFA staff guide users through the various information sources in an informal manner. This is not to say that it is not thought through but, rather, that knowledge of where to go and who to go to are things that are learnt from experience and through building up relationships with colleagues. A more explicit and formal system would be required if people, lacking this local knowledge, were to seek experts to guide them through the information resources of the archive. This would also apply to new staff at the archive and for collaboration among colleagues of different institutions. One solution to this issue would be a database that contained profiles of the individual staff within the archive – and possibly external experts as well – indicating their areas of expertise and special interest.

3. Content access to institutions

Certain of the themes highlighted above also apply here. As with the other archives NFA is involved in a number of international collaborations. These collaborations flourish even though there is no information resource available that really supports collaboration initiatives. At present, therefore, contacts with other archives are initiated because, for example, one archive is interested in showing a film from a particular country. In this context it is natural to contact the national film archive of the country in question. Much of this information is, in fact, already available from the information resources provided by FIAF. It is more difficult, though, to initiate collaboration on the basis of a shared research interest. This reflects the fact that there is no single information resource from where it is possible to obtain an overview of the various research activities that particular archives specialise in.

4. Access to high quality references

Although NFA is naturally the definitive source on Czech films and filmmaking the archive also holds and acquires foreign films. Access to information about foreign films and filmmaking is less reliable; even when the source is well establised it is possible to find ommisions and mistakes. As a result it may be necessary for NFA staff to undertake more basic research in order to find the information they need.

5. Search strategies

A wide range of search options should be available and a collaboratory should support strategies that are preferred by the actors in the archive:

- Analytic search strategy
- Empirical search strategy
- Browsing strategy
- Search by analogy
- Bibliographic search strategy

6. User Services

The following recommendations on users' access to the archive predominantly reflect recommendations from the respondents. So although there was no interest at NFA in providing users with direct access to its information content, the goal of improving user services remains an important issue. This was witnessed in the NFA library, where much time and resources had been allocated to the task of introducing a new database that would provide a more intuitive and less complex interface for end users. One anticipated outcome of this process is that library staff will reduce the time they currently spend working with users. Although it is important to remain sensitive to NFA's wishes in this

respect this is, nonetheless, a strategy that could be applied effectively in other areas of the archive. Staff might, therefore, benefit from a system that dealt with simple requests about a film. This would allow them more time on other tasks including, of course, dealing with the more complex user requests in which mediation is both necessary and desirable.

7. Frequently Asked Questions

Although all user requests are documented at NFA this remains an under-exploited information resource. That is, the archive has not tried to use the information to analyse user requests according to type, volume, frequency, depth etc. There is scope, therefore, to further exploit the information that NFA has about it users. It might be possible, for example, to determine common questions and formulate standard answers that could be given to users in the future. When NFA establishes its own Internet homepage these standard responses could be located in a FAQ link. Following and analysing user requests could also provide the archive with information that might enhance its ability to respond quickly and thoroughly to information demands. In the same way that it is difficult to consider the history of film in isolation from social history as a whole, so it is difficult to appreciate, at any given time, the interest that there is in film without looking at a broader social framework. Following and analysing the information that they have about user requests NFA might be able to draw conclusions about what their users are interested in and why.

8. Current value added information

Apart from cataloging work, NFA's commercial activities have also contributed to the development of keywords by a bottom - up method. Thus the work involved in producing a Czech filmography has also been exploited so that it automatically contributed to NFA's filmographic database. In similar vein, the process of scanning posters and film stills in order to preserve them is closely combined with the process of entering information about them into NFA's poster database. The film screenings in which numerous staff participate are also important here, especially since they combine an activity in which all can participate as equals with work tasks that are important to the development of the archive. It is unclear, though, whether this rich resource of experience and expertise is, beyond the immediate issues it addresses, exploited to its full potential. Certainly some more or less formal report, providing at least an overview of the discussion and the conclusions that were reached, could be an important resource for others both inside and outside of NFA.

9 Work in DIF archive

The German Film Institute (DIF) is located in Frankfurt am Main and Wiesbaden and is one of the largest cinematic institutions of Germany. The archive is funded by both governmental institutions, state broadcasting authorities and organisations within the film industry. The archive is a non-profit organisation. The archive consists of two branches: the text and photo archive and the film archive and has about 23 employees. It's divided in the following departments: film archive, photo archive (posters, photos), library (books, videos), journal and newspaper archive, database, digitisation and Internet department. The collections have been developed since 1949 and consist of films, clippings, microfilms, film magazines, stills, film programs, posters and censorship cards. DIF is a member of FIAF and participates in international projects.

9.1 The work domain

Goals	Define DIF's situation, the problems, daily work, define the function and significance of an archive in modern times and the visions of DIF, active cultural mediation of film and German film history to the public, public film education, increase knowledge about German and foreign film, create image in society, strengthen the philological work on film history and culture and research on the NS movie inheritance,
Constraints	Digitise material to save space and preserve the sources, improve access to the material, make content indexing possible, make administration of the collections cheaper, easy and immediate updating, make it possible to make references between the different storage media and put together all information in one place. Make the website usable as a mean to access the collection and as an instrument for research for an international user group, establish one central DIF database.
	Time, space, funding, change from institutional funding to project funding, deadlines, getting access to and retrieving information from the web and from film distributors, users have to ask for permission to use photos and for appointments to visit DIF, acquisition criteria.
	Incompatible technologies, outdated technology isn't available today, digitalisation changes formats and colours of the films
Priorities	Customer oriented, open organisation, proximity to end-users, high quality customer service, free access to all kinds of media and possibilities of borrowing doublets, quality collections, advanced technology,
	quality collections, research projects, project work is a surplus, advanced technology, provide information or sources for obtaining complementary information, specialise in censorship issues primarily within West Germany, digitalisation, web-technology, exploit information sources through technology, resource sharing (data integration with collaborating institutions), value added information in databases, social relationships, make sure different groups of employees are able to communicate, organisational learning through knowledge sharing, strengthen archive's position and success in film science community, recognition in society of its activities, save money, get external funding for projects and digitised material.
Functions	Customer service, leading people to adequate information sources outside DIF, provide the space and tools for users to watch copies of original films at DIF, give conference talks and participate in conferences, disseminate information and work results, PR relations, release films in own Kino (Wiesbaden), show one film a month at the Film Museum (Frankfurt), make presentations of project results, organise collection, build new collections, sort photos, store objects of collection, search information, create new information and knowledge (value added information in archive), indexing, build censorship archive, selection and acquisition of new material, web design – updating, programming, collaborate on identification of stills, digitise materials, information exchange, build common database with Cinegraf, indirect subject searching in files, scan microfilms, distribute films from before 1945 in non-commercial areas, reconstruct films by means of contextual information provided by the Frankfurt branch of the archive, preserve (Wiesbaden),

	Introduce new technology to employees and educate them in the use of the technology, research in filmography and research projects, organise journal articles, organise film symposium and conferences, create policies for collection management, decision making e.g. about priorities of work, observe the tasks that others do to learn them, teach novice staff, build and maintain professional networks, find people with right expertise, collaborate with colleagues and other institutions, participate in project work and meetings, read papers and magazines and information from organisations, participate in FIAF discussion group at the Internet, meet with work group of librarians from film libraries, visit other picture archives, organise film festivals.
Work Processes	Talk to customers and reformulate customers' questions, talk to colleagues about web design and programmes, meet with colleagues internally and externally, write articles, write index cards, type into databases, write emails, write web programs, read papers and magazines, scan material, envelope photos.
Physical Objects	Colleagues, users, researchers, students, the cineastic community, film lovers, journalists, EPD Film and TV-stations, PR-agencies, film distribution companies, libraries, film festivals, film organisation SPIO, Wiesbaden, FIAF, FIAF discussion group, working group for film libraries, film museum, Deutsche Kinemathek, Freiwillige Selbstkontrolle in Wiesbaden, German state archive in Berlin and Koblenz, Hessen State, Leo Kirch, German scientific foundation, film museum in Frankfurt, Berlin, Potsdam and Munich, Zeughauskino in Berlin, Frankfurt, Marburg and Mainz universities, Arbeitskreis der Filmbibliotheken in Germany, Verbund der Frankfurter Museumsbibliotheken
	Storage rooms, collections, photos, envelopes, posters, silent films, feature films, documentaries, grey literature, books, articles, censorship cards, projects, magazines, files, text archives, photo archives, thesauri, manual indices, binders, manuals, index terms, subject description, scanners, cameras and microfiche, computers, German filmography on CD-ROM, databases, digital multimedia, Cinegraf database in Hamburg, Internet, website, file with e-mail user requests in mail programme, emails, Intranet, seminar for the personnel at DIF.

Figure 9.1: Means-ends abstraction hierarchy

9.1.1 Main goals and strategies

The goals of the archive fall within three broad categories. They are:

- To focus on the strategic situation of DIF as a cultural institution and on how the archive can develop itself to be able to keep up with constantly changing financial circumstances and work demands.
- To mediate the activities and results of DIF to the public in order to make the archive visible in the local as well as the national and international community. This is done by an attempt to educate the public within the area of German and foreign films and film history through, among other things, a strengthening of the research within the area of film history and culture.
- To enhance the accessibility of the archive's collections for both novice users and professional researchers. The archive aims to improve the physical accessibility of the collections by digitising different kinds of material. The material is placed on their website and is directly accessible from there. Furthermore this frees space at the archive that can be used to store non-digitised material. Accessibility is also improved by trying to integrate the various databases into one overall system. At the same time an attempt is made to improve the intellectual access to the collections by facilitating analysis, interpretation and restoration of films by supplying the users with adequate context information in their information retrieval.

9.1.2 Constraints

The goals and the work at DIF are constrained by a wide range of factors including the existing laws of Germany on e.g. copyright, archival obligations and by the market forces of the film industry, which effect the possibilities of DIF to acquire material and to provide access to the information contained in the archive. In addition lack of sufficient resources in terms of money and manpower limit the work at the archive. An example of this is the extremely resource demanding content indexing, which is not done at the present time but would yield a more effective exploitation of the collections. Lack of time

also influences the staff's work on developing their own photo-database and the time to do research in between providing customer service.

The archive is now funded in accordance with the number of projects it engages in, in contrast to the previous model of institutional funding. This forces the archive to emphasise project work over the basic work tasks of the archive e.g. collect, store and mediate films and related material. The nature of some of the work at the archive constrains the tasks of the employees e.g. the deadlines of the filmography. The project work effects the indexing of material as well as the maintenance and development of the databases. Furthermore the users' requests for permission to use material and to visit the archive also take up resources.

Finally the state of the available technology constrains the work at the archive. Use of incompatible technology inhibits the integration of the databases into one system and even the possibility for linking the information in the different systems. Outdated technology, such as microfilm copying machines, also constitutes a problem because it's getting harder and very expensive to find new tools that can provide access to the material. The use of new technology is, however, not without problems, since the digitalisation of film makes them loose their colour and format and as a result this new technology cannot contribute to the preservation of film and photos in the way intended originally.

9.1.3 Priorities

The priorities of DIF is first and foremost to provide a high quality service to the users of the archive in terms of e.g. the accessibility and quality of materials and amount of help offered at the institution.

Other important priorities are to improve collaboration internally and externally with colleagues and institutions and thereby enhance the knowledge sharing, which is, and will continue to be, a prerequisite for the work being done at the archive. This is because of a great reliance on both the explicit and the tacit knowledge of the employees. The work with the materials of the collections as well as the research projects and the mediation of the archive's work are also areas that are highly prioritised by employees and management. All of these priorities are influenced by a need to focus on saving money and achieving external funding for the diverse set of activities being performed at the archive.

9.1.4 Work functions

The aim of the analysis of work functions at FAA is to understand the way in which goals, constraints and priorities are executed in different functions, and how they relate to the different functions. It is also necessary to understand how these functions are interrelated. The analysis of work functions at FAA breaks down different activities into functional units. Although these do not always directly match actual departments in the archive they are broadly reflective of the different areas of work that are undertaken.

9.1.4.1 Information seeking services

Aims

Searching in and mediation of the collections and results of project work constitutes a large part of the working day of the employees at DIF. They search for information for users in the collections or refer them to other information sources when the resources at the archive are exhausted. In addition to this, one person is assigned to do public relations work for the institution or the events arranged by DIF.

The fundamental goal of the searching task is to help the user and to enhance the information contained in the collections. "It is not our only goal to do this work to help the users. If we have this information another goal is to build up the archive. If I make research and find something out we do this for the users as well as for us."

Searching does not only involve finding the answers to the user's question, but rather to bring the users to ask their questions in such a way that they can get material, in other words to go beyond the users' questions and bring out value added information. "..if there is a special question....about a film of a

book in the early 20s ...I told him Sweden 1920, but there is also a film from Denmark 1917 and from Great Britain 1913".

One of the employees spends most of his time with the users. He serves 1-3 users a day. Helping them takes from about one minute to one hour depending on the topic of the question. If the request involves using more time than that, it's recommended that users consult relevant, retrieved materials and find the answers themselves. The majority of the staff at DIF is able to handle the user requests and do so even if user service is not one of their main tasks. They step in when the person who normally takes care of the users is occupied elsewhere. This illustrates the significance that is placed on attending the users at the archive.

Sometimes requests are about photos accompanying a certain film. Because no subject description is available, the employees are dependent on their knowledge about films and the actual compilation. Another option is to search for title words in the database but since so many films exist that contain the same word in the title it takes up a lot of time and often results are not useful. Examples of user requests are subject searches for pictures of the devil, photos where people are telephoning, photos of women in a knight's costume, information about specific actors or personalities of films and the location of the film.

To adopt specific work practices and learn new tasks within the area of information seeking and user service the actors use the strategies that were also involved in the maintenance and management of collections. Consequently people learn by observing others and thereafter doing their own tasks in similar ways. Learning by doing is necessary, since the actors' education does not cover the practical work of an archive, such as interviewing the users and searching for answers and materials.

Information needs

The actors need information about the archive's collections and the information sources that they apply in the information seeking process e.g. databases, the Internet and domain specific encyclopaedias. They also need to gain some knowledge about their users to be able to elicit their actual information needs and the purpose of their searches.

There are several actors who have the same work function, for example serving users. These actors have different educational backgrounds, they have different knowledge and expertise about the film domain, and they have more than one work task. When searching for information in order to answer a user's request, the required expertise maybe possessed by one or more other actors in the archive or in the library. Thus a strategy, similar to the learning strategy, emerges from the employee's own need for additional information. When an employee has applied the normal search strategies and has not got satisfactory results s/he turns to one of the colleagues, who has been at the archive for several years, with the information request. The colleague is able to use their experience and tacit knowledge to obtain the needed information and as a result the archivist becomes capable of serving the user effectively.

The actors in the archive help solve the users' information needs or the user request is directed to the actor who has the relevant domain expertise or who has access to the files with the required information, for example special films. Colleagues work as consultants for each other helping them to solve their individual tasks. The criterion for choice of whom to consult among the colleagues depend on two factors: The closest colleague with whom you divide the work, and secondly on the character of the actor's information needs and the expertise of the colleagues. In such a work situation the actor is both a professional that serves the user and a user needing assistance from the colleagues. As one actor says: " I am more in the role of a customer, but a special customer, because I don't need appointments".

9.1.4.2 Maintenance and management of collections

Aims

Maintaining, managing and constantly developing the collections are the functions that together with the preservation of the material make up the foundation of the archive and create the conditions for the other services and activities e.g. the user service and the research projects.

The archivists spend a considerable amount of their working day on acquiring and collecting a diversity of films and film related material. This can be bought from diverse sources, received from generous donors or exchanged with other archives or similar institutions. The material is cataloged and the information is registered on microfilms, in card cataloges and in databases. The physical material is later stored in the archive. Some material is digitised and the electronic version of the material is stored in a database. Most of the material is cataloged on paper cards and the only access-point to the information is the title of the film. Photos are filed in alphabetical order by the title of the films they belong to and in some cases by the names of actors. Film related information is likewise stored alphabetically and is furthermore divided in sound films and silent films. Information about film personalities can be retrieved from microfilms. Photos released from distribution companies are found in a separate catalog. Hence no subject or content indexing is done at the present time because of lack of sufficient resources in terms of time and manpower. There is, however, a strong wish amongst the archivists for the kind of value-additions to the collections that the subject indexing would provide. DIF has specialised in the area of censorship material and has a large collection of this material stored in alphabetical order according to title.

There is one person who is responsible for the maintenance and development of the databases and this person works closely together with two other persons of whom one is responsible for the network and the PCs and the other is in charge of the website.

Information needs

The persons who are doing the cataloging of the different types of material need information about the standards and policies that define their tasks, e.g. principles for cataloging and filing. DIF has developed it's own principles and rules for describing the material and has not yet formalised these principles in written manuals. Therefore the staff members use older colleagues as mentors when they first learn the system. Later they keep on returning to their colleagues for advice and to retrieve additional information on work practices within the field. A more formal approach to integration of new employees and trainees is handled by two of the staff members who educate and introduce newcomers to the work at the archive.

The persons who are in charge of the technology at DIF need updates on the current states of the relevant IT within the field and programming language. The database developer has a background in information science and he might use that as a means to find information about technology and system design.

9.1.4.3 Research

Aims

There are four kinds of research tasks as perceived by the staff at DIF:

- One research task is driven by the archive users' needs. Researching in and outside the archive is necessary to answer their requests, and by doing so, an investigation of issues take place that is often beyond the user's literal formulation of a need. In the course of this process new knowledge is created about the topic and sometimes this knowledge is used to value-add the cataloging of the material. This research is not published.

- Another kind of research is driven by a personal interest in specific topics and the activities related to research (publish, writing articles, editing journals, give public talks, organise conferences etc). Some of this work takes place in the leisure time, and is a contribution to the community of film science research.

- A third kind of research is driven by the institutional goals of the archive. As a national institute, the archive takes on some responsibilities, for example to create a filmography of German films since 1946. The manager then delegates this task to an actor, who is responsible for doing the research.

- The fourth kind of research is participation in international and national projects. The research projects are driven by the institutional goals to improve the quality and costs of the work by further developing the application of technology in the archive's collections and also research on the

expansion of collections. The COLLATE project and the GoEast Festival of central and eastern European films are examples of this research.

Information needs

The persons that do research at DIF need information for decision making to be able to focus their articles, conferences etc. Examples of needs are information about which film festivals exist, on what festival a specific film is shown, information about which German films the distributors' have in stock or the availability of text material or censorship decisions. There is also a need for extracting information from relevant experts within the film domain, for example to find copies of film. A database with information about the expertise of people in the film profession would be useful, but this might be constrained by the unwritten rules that a person has to provide information to receive information. This means that the film society is very closed and that its members are not likely to circulate their information unless they get something in return that serves their purposes. It might be difficult for the archive to find enough valuable information for this kind of trade.

9.1.5 Work processes

The archivists talk to the users of DIF and negotiate their requests to formulate and translate their requests to the information retrieval systems of the archive. They also speak and meet with colleagues about e.g. development of the indexing procedures, web-design and ongoing projects. Every Monday there is a general meeting for all employees where the status of project work is discussed. There is also a lot of written communication going on e.g. emails to users and collaborators, indexing in manual and electronic systems and use of PCs.

9.1.6 Configuration, objects and tools

The employees are the only ones that have access to the manual card indexes as well as to the different databases for films, posters, film programmes and the filmography. Besides these databases the photo department is making a small database of their own containing 100 of the archive's 1,5 million photos. They have a lot of unidentified photos and envision a platform on the Internet to get assistance for the identification of this material. Users must either come to the archive to phrase requests or send an email to seek information.

The databases are Access relational databases where the id number of the items links the various databases on films, photos etc. There is a profound wish among all the staff members for an integration of the different databases in one central information system and for getting the card files in the database. In addition to this the actors envision a common German information system for cultural institutions that share the same characteristics as DIF. This would reduce time spend on seeking information for e.g. the filmography and prevent that the same analysis and editing work is carried out in several institutions. Furthermore sharing tasks and coordinating work would free time for other work tasks at the archive.

DIF has a website containing factual information about the archive, its' history, staff, opening hours, ongoing projects etc. There is also a description of each department and a possibility to get in contact with the experts from the various topics that the archive deals with. Finally the website provides a searching facility which allows the user to search for information about films using the title, persons or classes of films, e.g. documentaries, as access-points. The Intranet at DIF provides access to databases, search engines and annotations that are relevant for the daily work and possibilities for download of software etc. The Intranet is not used for discussions of work or the archive's strategies, neither for postings of social events nor for communication amongst the staff members.

The information sources used at DIF are various and include books, yearbooks, newspapers, film magazines, film-festival programmes, the Internet, television programmes, other archives and libraries. Finally people internally and externally are used as professional networks and contacts and by that they make up valuable information sources.

9.2 Actors

The majority of the staff at DIF have university degrees within the areas of English, literature, education, political economics and information science. They have worked at DIF in periods ranging from a number of months, a number of years, as is the case for the majority of staff, through to one person who has worked there for thirty years. Thus the employees at DIF are all highly educated, the majority is relatively young and have a few years of experience within the field. This indicates that there is a high degree of dependency of the knowledge of the more experienced employee. There are plans to develop a database to capture his knowledge so that this valuable source doesn't disappear when he retires. The actors have different areas of interest such as silent films, film history, science fiction, action films and documentaries and to some extent they achieve an expert knowledge that covers a wide range of the themes of potential user requests. The DIF actors often do work task that can be characterised as dealing with both the form and the content of the archive material e.g. cataloging and user service. This creates diversity in the work and makes the actors appreciate their job.

9.3 Work organisation

The analysis of the general functions at DIF showed that the work at the archive consists of a multitude of functions that are interwoven and in some cases the execution of a task depends upon the initiation or accomplishment of other tasks. This makes the work tasks and the work situations complex and requires that the employees have an ability to plan their daily work effectively but also that this planning can be changed ad hoc to suit unanticipated tasks or demands from collaborators or users.

The manager allocates the tasks to the actors, but when two actors work on the same task, the actor, who is most knowledgeable and has most experience, determines the division of work. The manager's work functions are both the formulation of strategies and the making of priorities for the institution's implementation of its goals. The manager also assigns projects to the staff and keeps an eye on the accomplishments that are made by the project workers. Some people are employed for specific projects and leave the archive afterwards taking with them their knowledge about work procedures and systems. This can influence a system like COLLATE considerably since the project workers might be the only ones that understand the system adequately and therefore be the only ones able to introduce it properly in the organisation.

The coordination of work at DIF is predominantly related to the work function of user service; for example emails from customers, because these can be sent to more than one actor. In order to save resources and to avoid that more than one actor works on the answers, the task is coordinated, and the answer of the email is allocated to one actor according to expertise. Talking to colleagues when searching for information identifies the overlap. The work coordination takes place as a negotiation, and in addition to expertise, the coordination may be based on the social roles that have been developed at the archive in relation to the social interaction among the actors. For example, one actor has a lot of external relationships with archives and museums, and tends to solve issues that involve social interaction with these institutions. Another actor may have the competence and social style to work as a facilitator of the collaboration at DIF.

9.4 Collaboration

Collaboration internally in the archive is done within the normal work tasks of the archive i.e. discussions about cataloging, during specific assignments such as information seeking for materials on upcoming films from the distributors, in project work and in the planning of great events such as film festivals.

Collective work in groups

This means that a group of people acts together pooling their resources and knowledge together in a collective activity that is not structured according to work functions. An example is the annual meetings with the whole staff, where they discuss their work and the workplace. They all work together on the same task during a one-day seminar, where the work place and possible future changes and visions are discussed e.g. the need for new technology and the priorities of work.

Collaboration in teams

On the research and development tasks, work takes place in externally funded projects like COLLATE. The project work at DIF in the COLLATE project has two important purposes that are possibly reflected in other projects as well. One purpose is to provide input to the project from the archive's film domain knowledge and materials and to gain new knowledge and materials to improve the collections of DIF. Another purpose is to mediate knowledge about the work in archives. Another self-organised team that is not project related, but was established because of the actors' own preferences and early initiatives, is the work on acquisition of new technology and the daily administration of technology, the hardware and software issues, and the web presentations. The team meets and discusses, everybody has his own functions, but the team members collaborate on doing the technology work together. They also work on teaching colleagues how they can use Internet and Intranet, searching the web, how to use CD-ROM collections, databases etc. The collaboration is driven by the initiative of the individual actors and is organised ad hoc.

Collaboration with institutions

DIF has an extensive collaboration with national and international archives and other organisations such as Cinegraf, the Frankfurt Film Museum and Deutsche Kinemathek etc. This collaboration consists of 1. Improving information seeking about relevant film-related information and locations of films, 2. Development of common tools such as databases containing filmographic data or archive information systems in general i.e. definitions of fields and designs, 3. Exhibitions and retrospectives, 4. Customer service, 5. Technology, 6. Knowledge sharing i.e. insight in methods and services is gained by visiting other archives and vice versa, 7. Mediation of archive activities e.g. through journalists, 8. Archival development and standards e.g. FIAF and working groups for film libraries. The archive staff constantly tries to extend its collaboration with other institutions in order to perform the work tasks effectively and achieve the goals of the archive.

9.5 Collaborative information seeking in email requests

Most of the information seeking carried out at DIF is initiated by phone contacts but an increasing amount of the information seeking is initiated by email requests. Of the several thousand emails DIF receive each year roughly 10% are requests from users searching for material on specific films, persons, subjects, and the like. In 2000 DIF received approximately 200 such email requests. This body of requests provides an opportunity to analyse the kinds of information needs that cause people to contact DIF, the information requesters provide in describing their information need, and how this impacts on the indexing and retrieval facilities needed by DIF employees. The email requests differ widely with respect to contents and the time it takes to answer them – from very specific requests, which can be answered right away, to complex requests, which are answered in a stepwise manner as the requested information is collected. The following analysis is based on 128 of the email requests received by DIF in 2000. It should be noted that the analysis involves the requests only, the answers to the requests are not included in the analysis.

Types of requests

Meadow (1992) identify four generic types of searches:

- *Known-item searching*. The searcher knows exactly what records are wanted and can specify them by means of searchable attributes. Example: "The Austrian film 'Der Feldherrnhügel' by E. Marischka, 1953". The searcher will recognise the desired records, if seen.
- *Fact retrieval*. The searcher is looking for specific information, but without necessarily knowing where to look for it. Example: "Where and when did the silent-film actress Lya Mara die?" It is not certain what terms to use for searching, but some initial candidates are readily available.
- *Subject retrieval*. The searcher is looking for information on a subject in general. Example: "What are the reasons why 80% of the people who went to the cinema in Germany in 1998 saw an American, rather than a European, film? " There is no one way to describe the subject and no one way the desired information will be represented.

- *Exploratory retrieval*. The searcher intends to find out what kinds of information are available, not to answer a specific question. Example: “If you are selling video copies of silent films, please send me a catalog with the titles of the films you have available”.

Figure 9.2 shows that DIF receives requests of all four types and, in addition, a small number of ‘Other’ requests, which are primarily concerned with establishing collaboration, rather than retrieving information. The majority of the known-item searches are requests for a specific film, which the requester wants to see. These requests generally contain the title, year, and director of the film. Subject retrieval is conventionally held to require that the records of a collection are indexed with terms describing the subject matter of the records. Such indexing is however vulnerable to change and diversity (see, e.g., Blair & Maron, 1985) and, consequently, people often try to avoid relying too much on subject retrieval. In situations where people know the collection or the subject well, it is often possible to replace subject retrieval with a number of known-item searches. When people are new to the collection and subject, another way to cope with change and diversity is to perform subject retrieval by browsing large amounts of possibly relevant material rather than by attempting to identify the relevant records through querying. The email requests contain numerous examples of subject retrieval that is wholly or partly replaced with known-item searching. Typically, a subject is ‘converted’ into known-item searches for a couple of films that are known (or believed) to be pivotal to the subject. When people are uncertain about the contents of a collection, studies have also found that searchers start out by describing their information need at a general level and only gradually move on to describing what it is they actually want. Here subject retrieval is – at least initially – turned into exploratory retrieval. The email requests include a few examples of this, but the phenomenon is likely to be more characteristic of oral communication than of written communication.

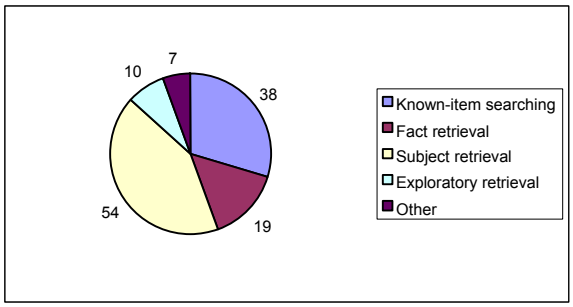

Figure 9.2: Request types

Context plus focus

The tendency to make requests more specific than the actual information need (e.g., by substituting known-item searches for subject retrieval) creates a distinction between the focus of the request and the context in which the outcome of the request is to be used:

- *Context*. The context in which the outcome of the request is to be used concerns *why* the information is needed. The context may or may not be part of a request.
- *Focus*. The focus of the request concerns *what* is specifically requested. Most requests provide a focus, but it is also possible to make a request by providing information about the context only.

Figure 9.3 shows that 45% of the requests provide a focus only. Here the DIF employees get no information about the reasons why the requested information is needed and, consequently, it is very difficult for them to form an interpretation of the request in order to judge the relevance of records and other pieces of information. The focus-only requests make up 31 of the 38 known-item searches and if the provided information is sufficient to unambiguously identify the desired record there is no need for context information in these cases. However, the focus-only requests also make up 13 of the 54 subject searches. A typical example of these requests is to ask for all information about a specific film. Since it is normally highly time consuming to find all information about a film the DIF employees are reluctant to undertake such a search without knowing whether ‘all’ is to be taken literally. To clarify these requests the DIF employees enter into a dialogue with the requesters. 42% of the requests provide information about both the context and the focus of the request. A typical example of these requests is students who are writing a project or thesis and ask for material about a specific film, director, or actor. These requests contain information about the student’s project in general (context)

as well as the requested film, director, or actor (focus). Here, the DIF employees can direct their searches for material about, say, the film toward material of relevance to the subject of the student's project. Finally, 13% of the requests provide only context information. These requests are often of the exploratory type where the requester is interested in information about what kinds of information and material the archive can provide.

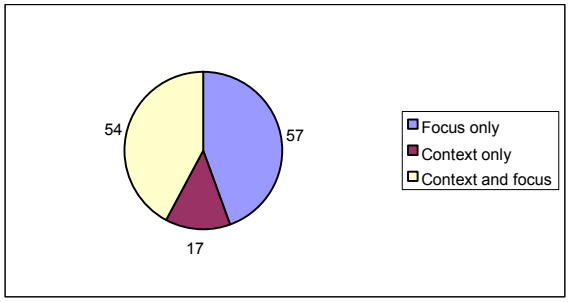

Figure 9.3: Context plus focus

Desired outcome

Depending on the request and the contents of the archive the outcome of a request can be that the requester gets access to the archive, gets material, or gets information. The requests – mostly explicitly but in some cases merely implicitly – specify the desired type of outcome:

- *Access*. The requester wants to make arrangements for visiting the archive. In some cases the requester knows, from previous requests or visits, that the needed material is there; in the remaining cases the wish to visit the archive is tied to a positive outcome of the requester's query.
- *Material*. The requester asks for material. The requested material may, for example, be original items for an exhibition or video-copies of films for private possession.
- *Information*. The requester wants a piece of information. This piece of information may, for example, be a specific fact, such as when dubbing was introduced in Germany, information about what DIF's collection contains, or an analysis of some of the items in the collection.

Figure 9.4 shows that 47% of the requesters ask for (copies of) material from the archive. These requesters – typically researchers and students – want themselves to watch the films or analyse the written material. This strongly suggests that many requesters will appreciate online access to at least parts of the collection. Other requesters (about 40%) ask for information. This includes for example the fact retrieval requests. Many of these requesters would – probably – be unable to find the desired piece of information themselves, if they were simply provided with online access to the collection.

It is noteworthy that the Access and Material categories concern requests which cover only the opening stage of the requesters' information seeking. Getting access to the archive or getting the desired material is simply a first step enabling the requesters to subsequently scrutinise the archived material. Thus, providing these requesters with (access to) the desired material is just a means to an end. If the DIF employees are to support the requesters in selecting material that serves this end, the requests must contain information about the context as well as the focus.

The other category contains ten requests in which the requester asks for both material and information.

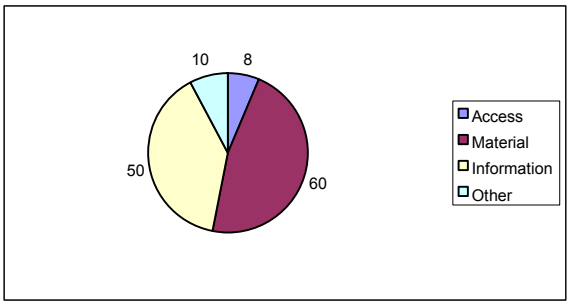

Figure 9.4: Desired outcome

Contents of requests

The information that requesters provide in describing their information needs must be matched by the available facilities for searching the archive. If the requests are not formulated in terms of searchable attributes it is left to the DIF employees to translate the requests into searchable attributes. This is difficult, at best – especially if the archived material is only indexed with a small set of attributes such as title, year, and director. The less indexing, the more the DIF employees have to rely on their domain expertise and their knowledge of the contents of the archive. The requests concerning films describe the information needs in terms of a broad range of information, see Table 9.1. The most prominent pieces of information used in describing the information needs are:

- *Title, year, and director*. By far the most frequent information found in requests is the title, year, and director of a film. These are standard bibliographic attributes.
- *Actors*. Usually a principal actor but at times also other actors, for example one related to the requester.
- *Time and place*. That is, where and when the film takes place.
- *Theme*. That is, what the film is about. For example, homosexuality.
- *Genre*. For example, westerns and detective stories.
- *Type*. For example, silent film or black/white film.
- *Book*. The author, title, or other information about the book on which the film is based.
- *Film music*. The music used in the film and/or the composer of this music.
- *Film company*. The company producing the film.
- *TV channel*. The television channel on which the film has been broadcasted.
- *Time during which the film was shown*. In some cases the period in which the film was shown in cinemas, in other cases the time it was broadcasted on television.

Figure 9.5 shows how frequently the different kinds of information appear in the requests (note that a request can contain information about any number of the attributes). The film titles are generally in the original language i.e., German, but some are in English. Furthermore, a few films are referred to by what appears to be a nickname, rather than their real title. For example, a series of silent films are referred to as the 'Dick und Doof Kurzfilmen'. Subject retrieval is conventionally associated with information such as *theme*, *genre*, *type*, and *time and place* but in the subject-retrieval requests received by DIF these attributes are no more frequent than attributes such *title*, *year*, *director*, and *actor*. It should also be noted that the time during which a film was shown is a genuinely dynamic category. Old films reappear in cinemas during festivals and on television at irregular intervals.

Category		Description
Titles		Title of film, including foreign-language titles and broadly used nicknames
	German title	
	English title	
	Nickname	
Year		Year the film was produced
Country		Nationality of the company/person producing the film
Film company		Film company producing the film
Persons		The various persons involved in the production of a film
	Director	
	Actors	
	Other persons	
Genre		Is the film a detective story, western, etc?
Type		Is the film a silent film, black/white film, etc?
Theme		What the film is about in terms of: Intentions, e.g. attitudes to homosexuality Emotional experience, e.g. everyday life in the countryside
	Intentions	
	Emotional experience	
Time and place		Where and when the film takes place
	Country	
	Location	
	Time	
Music		The music used in a film and its composer
	Music used in film	
	Composer of music	
Book		Book on which film is based
	Title of book	
	Author of book	
Source		Source includes: Cinemas in which film was shown TV channel on which film was broadcasted Time during which film was shown
	Cinema	
	TV channel	
	Date or period	
Sources of information about films		Film magazine and (film sections of) newspapers
	Film magazines	
	Film sections of newspapers	
Societies and festivals		Film festivals, film societies, and their members
	Film festivals	
	Film societies	
	Members/chairpersons	

Table 9.1: Contents of requests

Topics of requests

The topic of the requests is in many cases very similar to the pieces of information that make up the contents of the requests but this is not always the case. The dissimilarity is brought about by the previously discussed tendency of requests to divide into a focus and/or a context. Whereas the focus of the requests (analysed in the previous section) tends to concern what is – or is believed to be – searchable, the context tends to be biased toward the requesters' motivation for wanting the information. The context or topic of the requests centres on films but include a broader range of issues:

- Most requests are about films as such.
- Some requests treat films as a source of data about society and societal issues. For example, a request about how people dressed in the German countryside in the 1920s and several requests about attitudes to Holocaust.
- A smaller amount of requests concern the development, status, and main persons of film magazines, film festivals, and film societies.
- A few requests concern the (German) film industry as a whole. For example, "When was dubbing introduced in Germany?" and two requests about the dominance of US films in European cinemas.
- A few requests are about persons to whom the requester is personally related, irrespective of whether this person was a director, actor, or merely may have appeared in a newsreel.

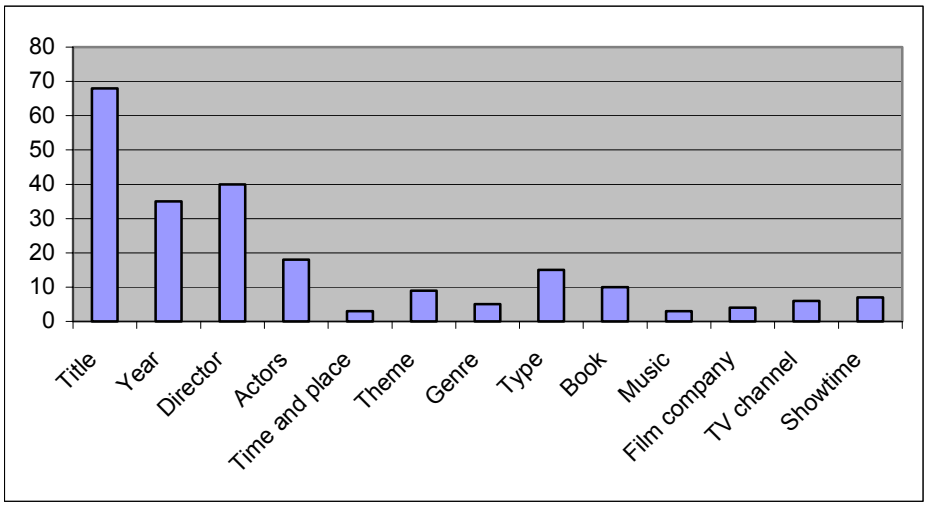

Figure 9.5: Contents of requests (N = 128)

9.6 Cataloging, classification and indexing tasks

DIF has designed a database for detailed registration of films. The database holds information about films as such and about the documents, music, persons, and organisations related to the registered films. The database contains about 25000 entries and grows with about 500 films a year. It is estimated that adding a film to the database takes an average of something like 4-5 hours.

Staff group	Designation
Darsteller	Darsteller, Mitwirkende, Sprecher, Synchronsprecher, Darsteller (Sonstiges)
Regie	Regie, Co-Regie, Künstlerische Oberleitung, Regie 2. Stab, Regie (Sonstiges)
Regie-Assistenz	Regie-Assistenz, Assistenz-Regie, Dialog-Regie, Regie-Volontär, Script, Regie-Assistenz (Sonstiges)
Drehbuch	Drehbuch, Drehbuch-Mitarbeit, Adaption, Szenarium, Dialoge, Deutsche Dialoge, Literarische Vorlage, Idee, Stoff, Originalgeschichte, Kommentar, Zwischentitel, Interviews, Übersetzung, Dramaturgie, Drehbuch (Sonstiges)
Kamera	Kamera, Kameraführung, Kamera-Assistenz, Material-Assistenz, 2. Kamera, Steadycam, Kamera-Überwachung, Farbberatung, Optische Spezialeffekte, Trick-Kamera, Animations-Kamera, Standfotos, Titelgrafik, Licht, Beleuchter, Kamera-Bühne, Dolly, Kamera (Sonstiges)
Bauten	Production Design, Bauten, Set Design, Set Dresser, Ausstattung, Bau-Ausführung, Storyboard, Zeichnungen, Kunstmaler, Plastiken, Requisite, Außenrequisite, Innenrequisite, Bühne, Titel, Animation, Bauten (Sonstiges)
Kostüme	Kostüme, Kostüm-Entwurf, Kostüm-Ausführung, Garderobe, Maske, Spezial-Maske, Frisuren, Kostüme (Sonstiges)
Schnitt	Schnitt, Schnitt-Assistenz, Schnitt-Volontär, Negativ-Schnitt, Video-Schnitt, MAZ-Schnitt, Ton-Schnitt, Synchron-Ton-Schnitt, Musik-Schnitt, Geräusche-Schnitt, Schnitt (Sonstiges)
Ton	Ton-Design, Ton, Ton-Assistenz, Ton-Überwachung, Musik-Aufnahmen, Synchron-Ton, Ton-Bearbeitung, Geräusche, Mischung, Ton (Sonstiges)
Musik	Musik, Musik-Bearbeitung, Musikalische Vorlage, Musikalische Leitung, Arrangement, Musik-Ausführung, Solisten, Musik (Sonstiges)
Sonstiges	Sonstiges, Choreografie, Beratung, Recherche, Spezialeffekte, Stunt-Koordination, Stunts, Casting, Produktionsfahrer, Catering, Sonstiges (Sonstiges)
Produktionsfirma	Produktionsfirma, in Co-Produktion mit, in Zusammenarbeit mit, im Auftrag von, hergestellt von, fertiggestellt von, Produktionsfirma (Sonstiges)
Produzent	Produzent, Co-Produzent, Redaktion, Ausführender Produzent, Executive Producer, Line Producer, Producer, Herstellungsleitung, Associate Producer, Produzent (Sonstiges)
Produktionsleitung	Produktionsleitung, Supervision, Produktionsleitung (Sonstiges)
Aufnahmeleitung	Aufnahmeleitung, Produktions-Assistenz, Produktions-Koordination, Pre-Production, Post-Production, Aufnahmeleitung (Sonstiges)
Sonstige Produktionsangaben	Geschäftsführung, Buchhaltung, Kasse, Produktions-Sekretariat, Sonstige Produktionsangaben (Sonstiges)
Verleih	Verleih, Erstverleih, Späterer Verleih, Aktueller Verleih, Video-Erstanbieter, Verleih (Sonstiges)
Filmförderung/ Sponsoren	Filmförderung, Sponsor, Filmförderung / Sponsoren (Sonstiges)
Musiktitel	Komposition, Text, Komposition / Text, Musikalische Leitung, Musikalische Vorlage, Bearbeitung, Arrangement, Chorleitung, Sonstige Beratung, Ausführung, Solisten, Gesang, Musiktitel (Sonstiges)

Table 9.2: Staff – the relation between a film and a person involved in the production of the film

To give a feel for the level of detail, Tables 9.2 to 9.4 show the codes available for registering the relation between a person and a film, the codes for different types of titles for a single film, and the

codes for the different types of censorship to which a film may have been subjected. Since the amount of information available about the films differs dramatically from one case to the other, it is neither possible nor desirable to opt for a uniform level of detail throughout the database.

The database fields concerning countries and citizenship make use of ISO standards to ensure a complete, standardised, and easily translatable coding of, for example, the country in which a certain title was used for a film, the language in which a document is written, or a person's nationality. Also, the registration of a film includes its Cinegraph identification number and thereby provides a link to further information in this comprehensive collection.

Title type
Arbeitstitel
Untertitel
Zensurtitel
TV-Titel
Video-Titel
1. Teil
Sonstiger Titel
Für die TV-Serie
Späterer Verleihtitel
Verleihtitel
Für die Reihe
Weitere Schreibweise
1. Episode
Transit-Titel
Späterer Untertitel
Deutscher Verleihtitel
Transit-Untertitel
Weiterer Titel
Früherer Titel
TV-Titel (franz. Titel in Arte)

Table 9.3: The different types of titles a film can have.

Furthermore, the information about, for example, organisations includes their URL and thereby makes it easy to look for additional information on the World Wide Web. However, apart from these few fields with a standardised format it seems as if it is the staff at DIF who have developed most of the codes used in classifying the films. This testifies to the lack or insufficiency of national as well as international standards regarding information management in film archives, but it also shows that DIF is one of the institutions with the interest and capability to contribute to such standardisation efforts.

It is evident that the film database is biased toward a careful registration of the facts and figures regarding the production of the films and devotes little attention to what the films are about. The database distinguishes between six different genres (Animation films, Bergfilm, Kulturfilm, Lehrfilm, Puppenfilm, and Werbefilm) and it is registered whether the film is fiction or non-fiction, but there is no subject classification or subject indexing. Apart from what can be deduced from the title(s) of a film, any information about theme, author intention, emotional experience, and so forth is absent from the database. Compared to the email requests analysed in Section 8.2 the absence of subject information introduces a mismatch between the database and a considerable portion of the requests. These requests can only be answered if the DIF employees possess the knowledge necessary to bridge the gap between the subject-related requests and the more factual fields in the database. They can also be answered if the DIF employees know about other sources, such as books or articles in film magazines, that treat the subjects and provide links to relevant films. While the film database may be immensely valuable to people with an interest in the production of old (German) films the registered films also provide opportunities to address numerous other issues. Currently, the film database reflects

a rather narrow view of the registered films. The requests provide a broader spectrum of views on the types of issues to which the archive may contribute valuable information. For example, some requests treat films as a source of data about society and societal issues. To utilise the collection for these additional purposes it is necessary to extend the classification and indexing with information about the subject of the films – their contents.

9.7 Needs arisen from the work analysis of DIF

According to the field studies of archive work conducted so far, a shared virtual collaboratory on the web should be based on the needs presented below. A collaboratory should also support the existing collaboration and face-to-face communication that is highly valued by the archivists, their professional networks and their users. The purpose of this analysis and the subsequent recommendations is to provide a source that can inspire the requirements for the COLLATE Collaboratory. These are ideas for ways in which the current way of working combined with new opportunities may help in accomplishing the goals and work activities of the archive.

1. End-user access

Many people already interact with DIF through email, and a number of them have visited the DIF website prior to emailing. These people are prepared to look for information on the Web, and they increasingly expect that institutions such as archives and museums have some contents online, rather than merely an 'electronic business card' for the physical institution. It would be but a small step for most of the email requesters to look into a well structured collaboratory to get at least an impression of what the archive has to offer. End-user access seems a key recommendation.

2. Flexible classification and indexing facilities which allow for multiple perspectives and development over time

The collection is, to a large extent, researched through thesis work and other efforts external to the archive. A number of the email requests concern students and researchers who, through their work, explore the collection and add to the general knowledge of the films. Some of this work involves classification and indexing of films, and some of it affects the ways in which films ought to be classified and indexed in the archive. Whereas this is immensely valuable it also means that a lot of the work affecting the classification and indexing of the films is done by people who cannot be expected to comply with a standardised set of procedures for classifying and indexing DIF material. Thus, if a collaboratory is to benefit from the work done by students and researchers it must be possible to create, work with, and inter-link different, partial, and partly conflicting classifications and indexing schemes. Otherwise the students and researchers will refrain from contributing their classifications and indexing to the collaboratory and merely use it as a way of extracting information from the archive. This calls for classification and indexing facilities that allow for multiple perspectives, support gradual extraction of categories, indexing terms, etc. into a common classification and indexing scheme, and enable searches that span several indexing schemes in a disciplined manner.

3. Advertising topics or items in need of research

It has, for example, been suggested to create a public forum where all the unidentified photos could be posted and everybody could contribute to their identification. It can be noted that this has been done successfully in some museums (e.g., the Hunt Museum, Ireland, www.ul.ie/~hunt). The idea could easily be extended beyond physical items to abstract topics. Such a forum could foster focused collaboration between the staff and people external to the archive, for example students looking for thesis topics and leisure-time researchers with a rare knowledge of specific films or actors. Advertising topics and items in need of research in a web collaboratory may potentially change users/requesters into contributors and the archive into a more dynamic and recognised institution.

4. Integration across formats

Whereas some material is electronic from the outset and other material is being digitised there will remain a large stock of material on paper or in other physical formats. The coverage of the collaboratory should not be determined by the format of the materials. Rather the collaboratory need to cover all sorts of materials and provide different ways of accessing them – on-screen viewing of electronic material, ordering of photocopies of paper-based material, and so forth. A special and very

important format is people. A collaboratory will have to take into account that people are a crucial source of information (see the next recommendation).

5. Provide a forum for discussions among people

People will appreciate that digitised material in a web collaboratory is easier to access than the physical collection but on the other hand, it is imperative to remember that lots of information and knowledge exist only in the heads of the staff. While some of this knowledge can be embodied in, for example, classification schemes this represents a long-term process, and a lot of knowledge will remain in people's heads only. Thus, the collaboratory should also provide facilities for treating people as information sources and for facilitating focused as well as open-ended discussions among people. The staff finds that their information seeking is governed by a you-have-to-give-information-to-get-information principle and that may mean that facilitation of discussion and other kinds of mutual exchanges are more effective than a database supporting people finding through descriptions of their areas of expertise.

6. Integration across departments

The requesters' interests do not follow the division of labour inherent in the division of the archive into a number of departments (film archive, photo archive, library, journal and newspaper archive, etc.). Many requests can only be answered by collecting material from several departments and this calls for an integration of the different collections into an inter-linked entity.

7. Access to all information about a film based on title, year (and director)

The majority of the requesters assume that the title and year, often supplemented with the director, uniquely identifies all information about a film. However, old films often exist in several versions from different years and with (slightly) varying or contested titles. Thus, the title and year do not provide an unproblematic unique identification of every film. Furthermore, the information provided by the requester may be imprecise. To enable access to the films through their title and year it is necessary to inter-link the different versions and provide access to this cluster of versions through the title and year of any of the versions. If some versions have several titles, or a title and a popular nickname, it must be possible to record all of them in a way that makes it possible to perform a title search that include all of them. The information about a film is not restricted to its different versions. The archive also contains, among other things, posters, reviews, and film magazines with articles about specific films, comparisons of films, analyses of topics relevant to multiple films, and so forth. In designing a collaboratory it has to be considered how all this information can be included in or linked to the cluster identified through the title and year of a film.

8. Subject retrieval

The way in which films are currently classified and indexed focuses on preservation, i.e., issues regarding the production of the films, such as the different versions of the films, the varying titles, and the staff involved in producing them. However, facilities for subject retrieval are necessary to support the full range of requests. This requires the adoption or creation of facilities such as thesauri or other controlled indexing vocabularies covering the subject domains treated in the films. When written material is digitised it could also be considered to apply automatic means of keyword extraction or allow for full-text queries.

9. Support similarity retrieval, emphasise interactivity, and invite exploration

The focus of many requests appears rather narrow. Some requests have a focus only; others provide both a focus and information about the context in which the desired information is to be used. In the requests with both a focus and a context there is often a considerable gap between the focus and the context. It seems as if the requester has tried to replace a subject, which is hard to describe precisely in a few words, with a known item that constitutes an instance of a highly relevant record. The consequence of this is twofold: (1) The requester is not only interested in the specified, known item but often also in other similar items. Thus, the collaboratory should provide support for similarity retrieval. The Book House system (Rasmussen et al., 1994) shows how similarity retrieval can be accomplished in a system where the items are systematically indexed. (2) The focus of the request is not a complete description of the information need. The context information, if present, provides a perspective necessary in interpreting which of the diverse records on a film that are relevant to the request. The

paucity of the context information and the often considerable gap between the focus and the context information indicates that the collaboratory should emphasise interactivity and invite exploration. Many requesters would appreciate an opportunity to develop their request through a dialogue where the collaboratory displays information about the collection and indexing as well as examples of records that match the current formulation of the request.

10. Standard answers to frequent requests

The prime example of a frequent request is the requests about purchasing a video copy of a film. Another frequent request – or aspect of requests – concerns the possibilities for visiting the archive (opening hours, etc.). It would expedite the answering of these requests if the collaboratory contained a collection of standard answers to these frequent requests, for example as FAQ (Frequently Asked Questions) webpages to which the staff could provide links. The standard answers should be available for linking, cutting, and pasting so that they could be incorporated freely in answers, which contained more than just the standard formulations.

10 Possibilities and constraints for the collaboratory

In order to establish a collaboration mediated by the COLLATE collaboratory among archives in Austria, Germany and Czech Republic it is important to consider the possible overlap in competence and performance criteria applied by the archivists in the three different countries. It is also important to consider the factors that have brought about these competencies and performance criteria. Four predominant factors will influence the behaviour of individual actors in their task situations. These are common for all three archives, although they have different manifestations. These factors have been analysed in the previous work analysis. They are:

- Work domain: The functional and intentional constraints represented within the conceptual levels of the means-ends abstraction hierarchy. These are imposed by the work domain and adopted by archivists
- Work organisation: The intentional constraints from the organisation of the work in the archive and the intentions involved in the work functions and expressed by collaborating archivists
- Actors' knowledge: the archivists' experience, skills and competence
- Subjective preferences: The archivist may have developed their own performance criteria in addition to those from institutional constraints based on their subjective work experiences.

Making explicit the factors that contribute to the actors' choice of work behaviour will help to plan how a new behaviour can be shaped by the possibilities and constraints that are implemented in the design of the COLLATE Collaboratory. Such information will also be useful, when a consensus has to be reached with respect to the desired work behaviour and the type of collaboration that will be pursued within the collaboratory. This, of course, will also depend upon the perceived role of the Collaboratory, and the extent to which a collaboratory is intended to be integrated into the daily work in archives.

The following is a selection of some of the action possibilities and constraints that should be involved in the design decisions and the strategies for collaboration. Since the collaboration involves three archives, an attempt has been made to sketch the key issues to be considered. They are briefly presented within the above mentioned categories of work domain, work organisation, and actors' knowledge.

10.1 Work domains in FAA, NFA and DIF

At a basic level it is possible to identify common goals for the three archives. The role as protector and mediator of cultural heritage is one which they all embrace. It is also the case that each archive has an interest in international collaboration, especially so with other film archives.

Goals and intentions

There are also some differences in the goals of the three archives. The importance of the public domain to archive work is a case in point; crucial to the activities of all three institutions it nonetheless appears in different guises within the different archives.

FAA's commitment to the public domain can be exemplified in a number of ways. Most importantly, however, it is seen in the commitment to and realisation of user services. More than simply providing end-users with good resources to access FAA's information content, the goal at FAA is to anticipate user interests and develop the archive's collection accordingly. This philosophy is based partly on a particular vision of archives as "information centres". It is also based in the belief that end-users are a potential source of expertise that can both assist archivists in understanding their collection more fully and contribute directly to the available knowledge about specific films, personalities or events not available to the archive from other sources.

NFA has a clear and strong commitment to the public domain in their role as a national institution. They emphasise their role as custodians of unique material that has both national and socio-historical importance. It is against this background that the emphasis on preservation and acquiring new material should be understood. As seen in the campaign to obtain amateur film, NFA view the public as a source of input for the archive. In the services they provide users they supply information about the

archive and its information content, primarily through expertise of the staff. For very good socio-historical reasons, NFA operates according to a different model of service than that in place at the other two archives.

At DIF it is possible to identify a commitment to the public domain that reflects aspects found in the other two archives. There is, for example, a similar commitment to service as seen in FAA. For DIF this is, however, primarily about improving the organisation of and access to its information content and less about seeking inspiration directly from users. At the same time DIF also strives to provide services that inform the public about its collection and the activities with which it is engaged. One strategy in this respect is to conduct basic research work that will contribute to the public understanding of filmmaking and film history.

Time and money

Constraints imposed by financial resources and time are common to the three archives. Staff at FAA, for example, complained that the pressure of time meant that it was difficult to provide users with the optimum service. At NFA, the complaint was that the increasing volume of user requests meant that staff had less time to devote to their work within the archive.

Legislation and policies

One constraint that does impact more or less equally on each archive is legislation. This may be national legislation relating to archiving [only applicable at NFA], international copyright law and, finally, FIAF's code for ethical conduct. Copyright and ownership of material is a very tangible constraint as it determines, along with FIAF, the extent to which the archives are able exploit the material in their possession. Since determining copyright is important but not always straightforward this is also a constraint that creates extra work for staff in the archives.

All three archives have a well developed policy for the selection of materials. The purpose of these policies is among others to secure high quality historically important material. These policies serve to implement goals and priorities of the archives. When making a selection of materials for a common information space for archivists, the selection strategies are likely to reflect differences among the archives' selection policies. The different selection policies create different strategies that are important for collocation, maintainance as well as sharing a common space of multimedia materials..

IT Tools

Due to the tight coupling between the institutional context and investment in information technology, the archives have each developed their particular configuration of information resources. The result of this, seen from the perspective of COLLATE, is that there is a lack of equivalence in the information technology resources available to the archives.

This lack of equivalence varies according to the nature of the system at issue. For local databases, therefore, it is clear that NFA's resources are more developed and sophisticated than those currently at DIF and FAA. In contrast, access to global systems, such as Internet and e-mail, is currently most restricted at NFA. Although this is not a problem as such it will mean that access to COLLATE will be more or less open to archive staff depending on the institution in which they work.

There remains much in the day-to-day work within film archives that is dependent on domain specific tools. This equipment, such as editing desks and digital video workstations, tends to be very expensive and it might be worthwhile to provide an inventory of the domain specific tools available to the different archives. This could provide a basis for establishing which site is best equipped to undertake which tasks.

10.2 Actors' knowledge and expertise

The fact that the collaboratory represents an entirely novel approach to collection building and collaboration however indicates that innovative means should be used to develop another kind of practice where the system is carefully adapted to the archives' present methods of work and, within

these constraints still offers new possibilities. There are many aspects to consider with respect to the actors that becomes involved in the collaboratory and their future roles.

Cross-disciplinary film domain knowledge

The majority of the actors in FAA, NFA and DIF have academic backgrounds within the areas of history, drama, film theory, film history and information science. Actors possess a detailed and extensive knowledge of the film domain and intersecting disciplines, such as history and linguistics. In addition, the actors have archive domain expertise (knowledge as well as skills), acquired through their educational background or through their work experience in the archive. Further competence development is achieved through national and international professional networking, educational activities for archivists and development projects, such as COLLATE. The archive expertise comprises a diversity of specialities like technical knowledge and skills, such as restoration and preservation of films, and documentary knowledge and skills, such as filmography production and mediation of film research in information seeking and cataloging. Likewise, the actors are specialised within exclusive subject domains such as silent films, animated films, films from specific countries, American film history etc., and contribute with this expert knowledge to the collections and activities of the archives. To some extent, the actors will have different or even diverging perspectives on how to research or work within the archive domain because of their different educational backgrounds and work experience. They complement and extend each other's knowledge and thus provide a comprehensive knowledge background for a collaboratory that enhances this opportunity for high quality work.

Information seeking and cataloging task knowledge

The archivists use their specific knowledge in their daily work at the archives within the areas of user service, organisation of materials, research and restoration and preservation. At DIF, an archivist with an educational background in information science is involved in cataloging tasks. Likewise, at NFA, actors educated as archivists work with some of the cataloging. Cataloging at the archives also involves staff that does not have a formal educational background in cataloging. At NFA and DIF the staff at the library are librarians or information scientists, as opposed to the actors involved in the FAA library.

The expertise of most of the actors at the three archives is not specifically directed at the tasks of organising and searching the collections. This kind of expertise is acquired as the work proceeds in the archives. This works out well since there is a fairly even distribution of knowledgeable actors that have worked together for many years at the respective archives and newcomers to the field. In relation to the collaboratory it is essential that the archivists are able to transfer this knowledge to the web media in order to input and catalogue the material in the collection in a manner that reflects the current work practices at the archives and possible uses of the material. Learning by doing and following the examples of more experienced colleagues are very important principles of work at the archives. Hence, it is likely that this tradition can be followed during the introduction of a collaboratory.

Knowledge about IT, web and collaboratories

The actors of the three archives have varying degrees of experience with information technology, and the use situations are quite different at the respective archives. The majority of the actors work with PCs in their daily work in all the archive departments and are as such familiar with inputting and seeking information by means of internal databases and the Internet.

FAA and DIF have created web sites that are used for visualising the activities of the archives, as well as Intranets that serve as internal notice boards. Access is provided to search engines and to film related institutions. None of these web sites are used for communication with end-users or collaborating institutions, except for providing contact email information, or for internal debate among the archivists. Consequently, none of the archivists are used to communicate in a virtual environment. Furthermore the NFA actors currently seem to have relatively little experience in web publishing, but their web site will be launched within a short period of time.

A common trait among the archives is that they are very short on IT personnel that are exclusively responsible for maintenance and development of the information systems and PCs. The archives all have positive attitudes towards using technology more effectively than is presently being done. This attitude could affect the use and acceptance of the collaboratory in a positive way. At DIF, the IT

function is divided between three archivist that are not professionals within this field. At FAA and NFA one person takes care of the entire technology department for each of the archives.

Presently, there are no public terminals for end-user searching at the archives, nor do the archives provide access to their databases from the end-users own terminals at their work or at home. An important prerequisite for experimenting with end-user participation in the collaboratory, for instance for annotation of materials, is that the end-users can easily access and use its interactive facilities such as editing programs, e-mail facilities etc.

Language and cultural background

When the collaboratory is being developed, issues concerning language and cultural background have to be taken into consideration because of the multinational group of actors that are supposed to use the collaboratory. One of the most evident issues is the language of the actors that are going to interact with the system. This issue is very closely connected to the language of the material in the collaboratory and the potentially specific national characters of certain document types.

Currently English has been chose as a working language in the collaboratory and by that it is intended to make the material accessible to the three archives as well as to international end-users. This common language must also enable the participants to handle the input and output of material in the collaboratory as well as to communicate with collaborators through the system. By choosing this approach there is a risk of constraining the communication and collaboration between the participants in the collaboratory, because of the need for working in a foreign language. Some of the archivists expressed that they sometimes found it difficult to express themselves properly in English, and others felt quite uncomfortable communicating in English at all because of an insufficient vocabulary. This indicates that the conversations between collaborators might be difficult and that facilities for supporting the dialogue might be needed.

Another approach to dealing with language issues and the possible barriers that might arise from the use of another language than the users' native languages is to provide the user with the opportunity to select between multi-lingual interfaces. The language of the materials in the collaboratory is German and Czech and this limits the usability of the documents to a small user group. The intention of providing transcriptions and possibly translations of the documents is likely to increase the usefulness of the collections.

Knowledge about collaborators

Another condition that must be fulfilled if the collaboratory shall function properly is that the knowledge in the documents of the collection and knowledge of the archivist is exploited for collaboration among the archives. This means that, not only must the archivist know the collections and the different types of material and information stored in the collaboratory. It is also imperative that they are mutually aware of the expertise and capabilities of the other participants of the collaboratory, exploit these sources of knowledge and willingly share their own knowledge with others. Bringing the actors together in a collaboratory is a unique opportunity to support and evolve knowledge sharing and professional networking. Presently, however, patterns of communication (including choice of medium for communication), knowledge sharing and networking among the staff in the archives as well as with their users are diverse, due to cultural as well as organisational and disciplinary constraints and traditions and personal preferences. For the empirical evaluation of the COLLATE prototype, such considerations must be taken into account.

Knowledge about the collaboratory

The risk of actually loosing knowledge about the working methods and tools of the collaboratory is however also an issue that has to be dealt with if the collaboratory mostly becomes part of project work. The collaboratory might also influence the amount of resources, in terms of manpower, invested in the administration of IT since a constant development of the system and education of the users becomes a necessity and adds a new task to the already very occupied IT specialist

Knowledge about collaborators and users

Another kind of knowledge that becomes relevant for the collaboration among the archives through the collaboratory is knowledge about end-users and collaborating organisations that are granted access to the collaboratory. Acquiring and possibly storing information about other participants in the collaboratory provides opportunities for adapting services and functionality of the system to suit the needs of its users. Furthermore the knowledge of the collaborators might enable a further value adding of the collections thus improving the outcome of using the collaboratory. Achieving this kind of knowledge might be restricted by a wish for anonymity of the users of the collaboratory who wants to control access to their personal information themselves. Procedures should thus be established to convey a feeling of trust and reliability of the system and the other participants by for instance enforcing the principles of reciprocity between receivers and senders of information to the system. But the level of technological knowledge might have to change with the advent of the collaboratory since considerable capabilities to navigate, retrieve information and communicate within the collaboratory is needed. As in the case of the domain experts and novices it is also important to support both the technological wizards and the inexperienced technology users in the collaboratory.

Knowledge representation in interfaces

This indicates that maintaining the known metaphors for system interfaces, principles for structuring information etc. might alleviate the transfer from one well-known work practice to an entirely new way of doing archive work. To consider the various perspective and discourses of the actors and the archives, two options manifest themselves. One option is to develop one interface based on the most salient characteristics of the actors and hence teach everybody else to use the system. This might limit the many domain experts in using their specific strategies for problem solving and decision making.

Another option is to design special interfaces for several different user groups and to allow the users to configure the interface in accordance with their needs. The danger of this is that each user ends up with an interface that does not resemble any other system in the collaboratory, thereby making interaction between users complex. In either case the support of experts and novices within the domain becomes of outmost importance.

Maintaining staff domain expertise

A variety of knowledge exploitation methods should be considered in order maintain and develop staff's domain expertise in the collaboratory. For instance, project work, on which great emphasis is placed at DIF, gains importance. Project work at DIF and to some degree also at NFA means that actors are hired for specific projects and leaves the organisation afterwards taking with them their knowledge. The collaboratory might be useful in capturing and formalising some of this knowledge if the collaboratory is used in the projects. Furthermore, the collaboratory could be useful for exploiting expert knowledge on 'best practices', 'recommended sources', etc., developed by regular staff at the archives. Knowledge exploitation could be done for individuals as well as for groups of staff, ranging from descriptions of one person's expertise (and for key staff especially) to forums created for discussions of particular shared professional developments and challenges, such as IT development, preservation, information seeking and cataloging.

10.3 Work organisation in FAA, NFA and DIF

DIF is undergoing a transition from a traditional hierarchical organisation to a project organisation and now has a very flat organisational structure where many of the work activities are organised in projects.

FAA is characterised by being a hierarchical organisation that consists of self-organising groups, which arrange their work activities according to the overall framework provided by the management. Project groups are however also a part of the organisation.

NFA has a hierarchical organisational structure and the management and the heads of the departments coordinate the work. As in the other two archives project work is also performed at NFA.

These different kinds of organisational structures influence the work coordination and the communication at the archives. The actors at the more self-organised archives have more influence on

their own work tasks and are, in some cases, more used to communicate through alternative communication channels such as for instance the Intranet and Internet.

If a **hierarchical structure** is applied in the collaboratory it means that rules and conventions for use of common standards for the registration and digitalisation of materials and for a common retrieval mechanism, are decided upon centrally from a pointed out management board. This top-down approach might limit the collaboration between the participants since decisions have to be brought up at management level before initiation of new projects etc. Furthermore it would demand a lot of work from the managers at the three archives to coordinate the entire interaction occurring at the collaboratory.

The collaboratory can also be organised according to **projects**, i.e. by groups of people that work together for a specific period of time. Once the project has reached its goals they move on to the next projects. If the collaboratory is organised within projects organisation of work according to a project structure will work out well. A number of groups will do their best to make the collaboratory function effectively and to make it acceptable to its users. After the project is finished there will however be no organisation of work, and maintenance and development of the system might be rudimentary, haphazard if it occurs at all. There is then a risk that the collaboratory becomes an appendix to the archives' other collections and that its facilities are not being effectively exploited.

Finally the organisational structure consisting of **self-organising groups** in a kind of matrix structure will have a rather effective impact on the work organisation and communication within the collaboratory. There are no time limits that influence the management of the collaboratory and the participants organise their work individually or in ad hoc groups that are focused on the same activities or topics. By that it's ensured that all participants are able to influence their own work situation, work task and collaboration with other members of the collaboratory. Applying this principle of self-organisation of the collaboration there is however a risk of developing an anarchical organisation structure where sub-optimisation becomes a problem because everybody works on his own goals thus inhibiting an overarching collaboration between the archives. Consequently, some work coordination initiatives might be necessary to avoid conflicting goals within the collaboratory.

The need for work organisation and facilitation of communication depends upon the actual degree of collaboration that the archives wish to engage in using the collaboratory. If the collaboration is limited to the archives' providing data to a shared information system, each of the archives can apply the types of work organisation that they are accustomed to from their institution since they after the implementation of the system don't need to interact further with the other archives. The need for organisation of the work increases with every step towards a system that is based on information exchange and ultimate sharing of the explicit and tacit knowledge embedded in the archive institutions and actors.

In addition to the degree of collaboration that is wanted in the COLLATE system, the need for a specific kind of work organisation will also be influenced by the intended use of the system within the respective archives. If the archives want the collaboratory to be of use to all the actors occupying diverse functions within the institutions and to end-users outside of the archives the work content and form must be organised so that all these diverse user groups are able to understand and utilise the system. This places heavy demands on establishing support for the different scientific domains, worldviews and discourses that are represented among the current user group of the archives. Taking this stand means that the collaboratory becomes a universal tool for support of work on the film domain. Another perspective could be to develop a very specialised tool for work on the censorship domain and by that restrict the collaboratory to be of interest mainly to the relatively small user groups within the archives. Theseuser groups concentrate on censorship and develop their field through the collaboration with other experts.

10.4 Possibilities and constraints in information seeking

Information seeking is a key activity in NFA, FAA as well as DIF but the various activities that enter into information seeking are not the same in the three archives. These differences among the archives mean that some of the issues discussed in this section are more pertinent to some archives than to others. However, to address the range of functions performed in three archives the collaboratory will have to accommodate these differences.

Openness to many kinds of uses

- *Possibilities*. The information-seeking facilities in the collaboratory could be focused tightly on specific film-related tasks or they can focus more broadly on providing a rich set of entry points into the collections. Facilities focused on film-related tasks provide opportunities for purpose-made facilities not otherwise available. Facilities attempting to provide a rich set of entry points into the collections are open to a broad range of uses.
- *Constraints*. There is a large step from the way work is currently accomplished in the archives to the kinds of facilities it would be technologically possible to include in a collaboratory. People are in general not very good at envisioning tools and ways of working that are profoundly different from their current tools and ways of working. Experiences with simple collaboratory facilities such as data sharing are most likely needed to help foster ideas and opinions about more tightly knit forms of collaboratory-based cooperation.
- *Conclusion*. The collaboratory is first and foremost established to support professional archivists in their information-seeking, classification, and preservation activities but it is, currently, difficult to spell out in more detail what collaborative facilities for these activities should look like. Rather, the collaboratory is initially to provide a basis for getting into cooperation and starting to develop ideas about what collaboration could mean, apart from data sharing. This requires that the collaboratory is kept open to many kinds of information seeking.

Collaborative information retrieval

- *Possibilities*. Many of the activities in the three archives are collaborative, and while the collaborating parties are sometimes co-located they are often physically distributed. The collaboratory could enable physically distributed archivists to meet online to collaboratively formulate information needs and search for information on specific issues. This way the collaboratory would support a broader range of activities than the situations in which one archivist needs information and another already possesses it.
- *Constraints*. It is not well known what people need to share in order to collaboratively search for information. While they will need to share data that lend themselves to electronic communication, they will also need to create, negotiate, and reach closure on ideas, concepts, procedures and so forth. Online support and mediation of such 'common information spaces' are replete with open research issues.
- *Conclusion*. The archivists in the three archives perform a great deal of collaborative information retrieval. If the collaboratory could support these activities it would significantly reduce the obstacles to cooperating at a distance. While video conferencing and facilities for online meeting rooms may provide inspiration computer support for collaborative information retrieval is, however, still an area with more questions than solutions.

End-user access

- *Possibilities*. A web-based collaboratory provides an obvious opportunity to allow any interested person – as opposed to professional archivists only – to search the collections. Websites are increasingly becoming an established way of communicating information to a world-wide audience. Such a window into the archives would also increase the visibility of the archives and provide a means of disseminating their work and services.
- *Constraints*. Interested end-users may not have access to the Internet, or they lack the bandwidth necessary to download extensive material such as video clips. The complexity of the collections may prevent end-users from conducting successful searches. Copyright issues may restrict the amounts of material that can be made freely available online.
- *Conclusion*. Limitations in Internet access will be a problem but the amount of email requests received (at DIF) indicates that many people will appreciate end-user access to the collaboratory. This may necessitate some search facilities dedicated to end-users. Ownership of rights may necessitate a pay-per-view scheme for some of the materials.

Overview of available sources

- *Possibilities*. In determining what resources to mobilise in order to answer a request archivists – or possibly end users – need an overview of the available sources: people involved in the collaboratory, materials in the collaboratory, and institutions, persons, and materials external to

the collaboratory. Such an overview would allow archivists/end users to recognise rather than recall useful resources.

- *Constraints*. As the collection grows larger it gets increasingly difficult to provide an overview (and increasingly tempting to resort to search facilities). A database with information about the expertise of people in the film profession might be constrained by the unwritten rule that a person has to provide information to receive information. Further, it may be difficult to keep up to date on the existence and quality of resources external to the collaboratory.
- *Conclusion*. Overview facilities are essential in helping to ensure that the most appropriate sources are used and in helping new users – staff members as well as end users – to get a handle on the collections and additional resources.

Known-item retrieval

- *Possibilities*. In a number of situations the archivists know exactly what they are looking for and expect to be able to look up this particular film, document, poster, etc. These searches are often done on the basis of the title, year, and – possibly – the director of the film in question. Known-item retrieval is an effective and direct way of extracting material from the collaboratory.
- *Constraints*. Relying on known-item retrieval often means that queries are formulated based on the archivists' assumptions about what items the collection may or may not contain. Thus, when known-item retrieval is used as a replacement of other types of requests (e.g., subject retrieval) there is a risk that the archivist does not consider looking for some of the relevant material contained in the collection.
- *Conclusion*. Known-item retrieval is definitely needed, and the way to circumvent its constraints is to have other retrieval facilities available for other types of requests.

Subject retrieval

- *Possibilities*. A number of the users of the archives are not interested in a specific film but in a specific subject. Facilities for subject retrieval would enable the archivists to use these users' subject descriptions directly as queries, rather than being forced to translate them into search attributes such as film titles and directors. While experienced archivists may be able to perform such translations based on their knowledge of films, less experienced archivists – and end users – will often not be able to do it.
- *Constraints*. Subject retrieval requires a considerable intellectual effort classifying and indexing the films according to what they are about. Automatic means of extracting such subject information can also be applied to the textual documents but requires electronic versions of the documents. Automatic extraction of subject information from the image and video material will require electronic versions of the material as well as development of extraction algorithms.
- *Conclusion*. Facilities for subject retrieval are necessary to utilise the archived material for tasks beyond preservation, for example as sources of material about societal issues. Specifically, it should be possible to search for categories of censorship, for example to retrieve the films that were censored for reasons of brutality and depravation.

Similarity retrieval

- *Possibilities*. Facilities that enable the archivist to search for material similar to a piece of material that has already been identified will relieve archivists from the difficult task of expressing their information need in abstract query terms. The email requests provide many examples of requesters using a particularly good example of a film suiting their needs as a primary element in their formulation of their request.
- *Constraints*. Similarity retrieval requires extensive classification of the material to set up the dimensions along which materials can be similar. Establishing these classifications is demanding in time and resources.
- *Conclusion*. Similarity retrieval fits very well into the ways users conceive and formulate their requests. Thus, users would presumably appreciate such facilities, especially the end users who are likely to frequently experience difficulties in replacing the good examples with other formulations of their requests.

Exploratory retrieval and browsing

- *Possibilities*. In line with facilities for providing an overview of the available sources, users will need facilities for exploring the collection to see, in more detail, what is there. Techniques for inviting exploration, for example hypertext and information visualisation, enable users to recognise what is needed, rather than making retrieval conditional on their ability to specify what they want. Thorough classification/indexing provides opportunities for generating many links automatically.
- *Constraints*. Links between various pieces of material may require an agreement or knowledge that has not yet been established. Initially, the materials can only be registered as independent entities. Extensive research may be required before it becomes possible to establish the relation between pieces of material and conclude that they are, for example, different versions of a single film. Also, exploratory retrieval may lead users to lose their focus or unintentionally confine their search to a subpart of the collection.
- *Conclusion*. Facilities for exploratory retrieval and browsing will be very useful ways of exploring the well-researched parts of the collection, for example by means of online guided tours. In the parts of the collection where the relationships among the materials have yet to be established, browsing and exploratory retrieval have less to offer.

Information about how materials can be accessed

- *Possibilities*. Some material is for use in the archive only, and users need information about opening hours and how to set up an appointment with a staff member (e.g., to view a film). Other material is available for loan, and users need information about whether it is currently available and how long it can be borrowed. Finally, some material is available for sale and could be advertised and sold through the collaboratory.
- *Constraints*. Information about the availability of the materials will, of course, have to be kept up to date but otherwise such information can be providing fairly simply by means of facilities available in many libraries and online museum shops.
- *Conclusion*. Users' decisions about whether to order some materials will often depend on their availability and price so this information should be provided up front.

Filtering of incoming requests

- *Possibilities*. Based on a registration of the competencies and special interests of the staff the collaboratory could route incoming requests to a person capable of answering it. This would provide requesters with one entry point when they wanted to post a request, and it would relieve the staff from forwarding requests to more competent colleagues. Further, the first step in handling the requests could be to automatically match them against a set of frequent questions for which standard answers have been made. Answering some requests in this automatic way would safe staff hours.
- *Constraints*. Requests may not fit the profile of one staff member and thus the staff may still have to spend a considerable amount of time collaborating on answering requests. Staff competencies and interests develop over time and the registration of them must thus be updated periodically. It may be inappropriate to automate the decision about whether a request is treated automatically or by a person.
- *Conclusion*. Freeing staff hours is necessary to make time for some of the suggested indexing and cataloging work. Further, a few frequent requests make up a rather large portion of the incoming requests. Some kind of filtering of incoming requests would be useful at present and necessary if the collaboratory causes an increase in the amount of requests.

Collaboration among experts

- *Possibilities.* All archives are involved in a number of international collaborations. These collaborations flourish even though there is no information resource available that really supports collaboration initiatives. Through the archives' participation in FIAF and through the personal initiative of staff a collaboratory could include extensive links with the international film archive community and related institutions both inside and outside of the countries. The collaboratory could have links to the staff of the archive and all the experts that are collaborators of the archive. This requires a standardised scheme that can be used to classify the important features of the experts

working with topics such as censorship, preservation, information retrieval and cataloging. A scheme is also required to make compatible and relevant information available about the experts in institutions. This will help the process of teaching novices about the expertise of all their colleagues, it will help experts to remember experts by browsing, and finally, it will be very important for a web based collaboration with other national and international institutions.

- *Constraints.* Actors will appreciate that digitised material in a web collaboratory is easier to access than the physical collection. On the other hand, lots of information and knowledge exist only in the heads of the staff. While some of this knowledge can be embodied in, for example, classification schemes this is a long-term process, and in any event a lot of knowledge will remain in people's heads only.

- *Conclusion*. Thus, the collaboratory should also provide facilities for treating people as information sources and for facilitating focused as well as open-ended discussions among people. The archivists finds that their information seeking is governed by a you-have-to-give-information-to-get-information principle and that may mean that facilitation of discussion and other kinds of mutual exchanges are more effective than a database supporting people finding through descriptions of their areas of expertise.

Focus on available web resources

- *Possibilities*. Apart from the resources available in the collaboratory, other online collections will be of interest to the users as they are readily accessible. A rich set of annotated links to other resources would weave the collaboratory into the World Wide Web and, thereby, strengthen the focus on the subject matter, European films from the 1920s and 1930s.
- *Constraints*. A focus on available Web resources will, however, blur the borders between, on the one hand, the institutions involved in the collaboratory and, on the other hand, the rest of the Web. This will make the collaboratory less powerful as a showcase for the involved archives.
- *Conclusion*. A select set of links to external resources will be necessary to provide the services requesters expect to get. The amount of additional links to other resources must be balanced against the need for and prospects of profiling NFA, FAA, and DIF through the collaboratory.

10.5 Possibilities and constraints in cataloging, classification and indexing

The following addresses some main collaboratory opportunities for classification, indexing, cataloging and data exchange that could be considered for analysing, describing and presenting the subject content of the archives. Presently, each archive approaches this challenge through creating cataloging entries in some form (electronically or as card files). In some cases, indexing languages have been developed for local standardised expressions of subject content. In addition, some archives have developed overall categories for the materials, such as types of material or genres. Likewise, content analysis and description involves collaboration with subject experts within and outside the archives. This collaboration also involves knowledge sharing on cataloging policies and 'best cataloging/classification practices'. The following possibilities and constraints are provided at a general collaboratory level, while taking local practices and needs into consideration as well.

Open-ended multimedia classification

- *Possibilities.* The classification facilities in the collaboratory can focus on standardising the ordering of knowledge and media as well as opening up to embracing diversity in conceptions of how the media could be arranged to comply with different views of knowledge and local adaptations to particular tasks in the collaboratory. Through standardised global orderings or classifications, an overall stability of the semantic basis of the collaboratory is ensured. Through diverse orderings, adaptations to local work context and workspaces are supported. Both types of classifications represent invariant structures of the multimedia collaboratory and constitute opportunities for collaboration between the actors in the collaboratory on understanding and developing shared conceptions on arrangements of media. Common information spaces for teamwork or individual work across locality or within a particular locality could be created dynamically through couplings between local schemes as well as couplings between local schemes and more global schemes.

- *Constraints.* Several classification schemes and thesauri have been developed through national and international standardisation activities in Europe as well as the US within the film domain, for instance within the Getty Museum project. The underlying rationale of such efforts is to create invariant structures for standardising the work tasks and processes of arranging media in collections, as well as uniform retrieval in film databases and web sites. Currently, the archives involved in the collaboratory have decided to apply the FIAF Cataloging Rules for Film Archives for cataloging the film media in the censorship case. In its present version (1991), the FIAF cataloging rules only marginally addresses the challenge of classification, except mentioning possibilities of using the classification codes of universal library schemes, such as the UDC, Dewey, etc., to express the subjects of a film. Such schemes may be useful starting points for representing the subjects of a film narrative, subjects that can span many different kinds of interests, objects, concepts and perspectives. However, these schemes have been developed for fact literature and are not readily applicable to express intentional information, such as emotional content of the films. Furthermore, the collaboratory deals with a diversity of materials. When viewed from the perspective of classification of films, these materials constitute important context information for the films. Conversely, when viewed from the perspective of censorship information, the films constitute context information together with other textual and pictorial information. This shift in perspectives is a generic work constraint in domain-specific multimedia work environments, such as the COLLATE collaboratory.

- *Conclusion.* The COLLATE collaboratory could allow for more flexible approaches to support the work tasks of arranging materials and providing content access to the collections through an approach of ecological classification schemes. Such schemes express the explicit as well as implicit invariant structures of the work domain. The invariant structures of the schemes are identified through work domain analysis, which addresses explicit structures such as applied standard schemes, but also captures hidden structures in the domain through articulating the diversity of needs and conceptions by the collaborating actors. Contrary to standard classification schemes that are often are designed from one particular point of view (a single discipline, paradigm or purpose), ecological classification schemes provide a transparent and structured information environment in which actors can navigate freely according to their current perspectives of work and subjective preferences. In order to support the actors' individual, local or team-oriented conceptions of the invariant structures of their current workspace, the ecological schemes could be open-ended in order to allow for local updating of concepts and structural views by the actors of the collaboratory. In order to support shifts of perspective when arranging and searching for different media in the collaboratory, separate classification schemes for each type of documentation could be developed, together with tools for coupling between each scheme. The stability of invariant structures in such schemes could simultaneously allow for flexible adaptations to particular work tasks and workspaces in the collaboratory in order to allow for applications of classification schemes to support the dynamism of new developments of knowledge.

Multimedia information model and flexible management of metadata

- *Possibilities.* Management of invariant structures in the collaboratory can be enabled through different approaches, ranging from centralised to distributed approaches, and combinations of both. In a centralised approach, only the archive staff in the collaboratory manages metadata. The responsibility can even be delegated to specialists among the staff. In a distributed model, all actors contribute to managing the metadata. In a combined approach, archive staff is responsible for the provision and maintenance of metadata in the collaboratory, while simultaneously allowing for contributions by all actors in the collaboratory that can add enrichments to database information in the shape of keywords, summaries, comments and annotations. The COLLATE approach envisions developments of advanced tools for metadata management, including text processing tools and meta-thesauri for switching between classificatory perspectives.

- *Constraints.* If a centralised model for metadata management is decided, the stability of the invariant structure can be ensured at an overall management level. An important prerequisite for this approach is agreement on a common conceptual ground. The advantage of such a centralised approach is stability of structure and content in metadata. A disadvantage can be lack of dynamism and flexibility. Through a purely centralised approach, metadata rapidly become outdated and do not reflect the actual, ongoing semantic/conceptual development in the collaboratory. Conversely, if a purely distributed model is applied, meta-context or "global context" can be lost. Even though the context information for individual and local contributions can be made

accessible to the actors in the collaboratory, it can be difficult to maintain a stable overview or meta-context, from where the actors can understand new globally shared metadata.

- *Conclusion.* Currently, the archives apply different approaches to metadata management, ranging from centralised approaches (standard schemes) to distributed approaches, where individual catalogers have developed local metadata standards in order to ensure stability and quality of local database entries. The performance criteria inherent in both approaches are easy and harmonised subject access to the archives' databases. Furthermore, the existence of these approaches implies that currently cataloging staff in all archives has expertise and knowledge of metadata management. It is premature at this stage to make suggestions for a centralised versus a distributed model for metadata management. However, the current task decisions and performance criteria of archives as found in the present work domain analysis point towards the possibility of a combined model where some metadata are managed at a centralised basis, while still allowing for distributed metadata management by local archives and by individual staff.

Multimedia data exchange and reuse

- *Possibilities.* Reduction of duplicate work for catalogers in local archives through reuse of data from other institutions, including all archives involved in the collaboratory. A further opportunity is reduction of duplicate work for individual catalogers or teams of catalogers in institutions where cataloging data cannot be interchanged through local networks and tools. Finally, possibilities include increase in the quality of local catalogs.

- *Constraints.* There are at present no common formats for exchange of data between the archives. For the censorship case, however, the FIAF format for film cataloging has been decided upon as the basis for exchanging film data for the collaboratory. Because COLLATE is a multimedia collaboratory, it could be envisioned to exchange several types of data, including information about books, images, sounds, censorship cards, user annotations etc. Furthermore, the information may be multilingual.

- *Conclusion.* In order to support multimedia data exchange, common exchange formats for multimedia information should be decided upon. In addition, support tools such as converters and protocols for exchanging multimedia information should be available in the collaboratory. An additional challenge in exchange of multimedia information is the current diversity of file formats, for instance for images, and the current diversity in hardware and software facilities to support this process. This means that the collaboratory must provide for tools to download, upload and open files for the staff as well as other users of the collaboratory, irrespective of current local/individual hardware and system configuration. In order to support multilingual information seeking, multilingual thesauri or intermediary languages could be developed. However, while such tools have been developed for other domains and cultures (for instance for the domain of pedagogic in Canada; Hudon, 1997), they require substantial effort, both with respect to consensus and decisions on maintenance and invariant structures, for instance: direct mapping between terms, or mapping through intermediary language.

Facilitating professional networking in classification and cataloging

- *Possibilities.* Presently, the staff in all COLLATE archives has unique expertise in multimedia classification and cataloging. At the same time, there are currently very few formal educational and training programs within this area of expertise. The collaboratory could provide facilities for sharing competence, ranging from general introductions to multimedia cataloging in online tutorials, to interactive forums for sharing particular expertise, including 'best practice' developed within one institution etc.

- *Constraints.* Collaboration on cataloging and coordination of multimedia cataloging practice is currently done very differently in the archives. Some archives (for instance, NFA) coordinate activities through the FIAF standard of cataloging rules as a coordination mechanism for standardising filmography work and ensuring the performance criterion of correctness of database entries. Other archives (for instance, FAA) have a more informal coordination and staff has expressed a need for more formal coordination of cataloging practice in order to ensure a higher degree of conformance in cataloging approach.

- *Conclusion.* Currently, cataloging staff exchange expertise in various work contexts, for instance, at local meetings (film screenings, teamwork on cataloging and classification), or in research and development projects, such as COLLATE. Furthermore, some cataloging experts have been or are involved in professional activities such as standardisation activities in FIAF (NFA), education (FAA) and professional networking with multimedia catalogers in other institutions (DIF). In order to create forums for sharing and developing innovative multimedia cataloging expertise and learning, all cataloging staff should have the necessary tools (technology) to participate in professional discussions and networks. Furthermore, such professional activities should be recognised as important and given high priority by each institution involved.

Collaborative multimedia subject analysis and indexing

- *Possibilities.* Collaborative subject analysis and indexing of multimedia materials in the collaboratory could be supported by a number of tools, such as faceted schemata that are tailored for subject analysis of specific media types (films, images, books, videos etc.) and their possible applications and uses in the collaboratory. Furthermore, access to context information for each type of document could be available though offering access to

1. Stable information, such as electronic dictionaries and encyclopaedias, common thesauri and classification schemes.

2. More dynamic context information, such as other documents (for subject analysis of films: reviews, censorship documents) and previous requests by users and their solutions.

   Access to such context information will not only support subject analysis of the multimedia documents, but also provide inspiration on how to express the subjects in indexing terms. For instance, access to user requests can facilitate expressing the subjects in the users' terminology. Furthermore, collaboration on subject analysis of media requiring a high degree of domain knowledge and documentation effort could be furthered through interactive online screening meetings, or online consultations between experts across staff and expert users involved in the collaboratory. Overall, such opportunities (facet schemata, coordination etc.) could enhance the probability of harmonised subject access to collections in collaboratory, across archives and databases.

- *Constraints.* Presently, some archives have developed standard procedures for collaborative subject analysis, for instance screening meetings at NFA in connection with the production of the filmography. Other archives have developed local standards, like skimming books and consulting handbooks, for analysing the subjects of a document, for instance at FAA. In some archives (DIF and FAA), the indexers also participate in information seeking activities and thus have a keen knowledge of the needs and terminology of the archives' users. Subject analysis and indexing addresses the content of the document as well as its possible uses. Enrolling experts in collaborative subject analysis, together with the indexing staff, can support decisions on possible uses (example: NFA). Decisions can also be made according to the catalogers' domain expertise and knowledge of user request types and terminology. In a multimedia collaboratory, approaches to subject analysis could vary according to type of medium to be analysed and indexed. At present, there is no overall explicit shared approach, addressing the diverse indexing requirements for different kinds of media.

- *Conclusion.* While support tools, such as schemata, thesauri, etc. can be useful for subject analysis and indexing, there is a need to agree on common quality procedures and performance criteria for the decision tasks involved for each type of medium. Thesauri developed for one medium may be or may not be applicable for other media. Furthermore, knowledge sharing with experts across collaborating institutions and with expert users also requires agreement of a common ground in another sense: each institution and culture (target groups) may give priority to particular aspects in the subjects of media. Hence, any common ground developed for this high-level decision task, involving the interests of many different target groups and interests, could only function as a guidance, not as a normative framework for concrete work procedures performed in individual institutions.

11 Conclusion and future work

Multimedia web collaboratories are a unique opportunity to store, document, mediate, discuss and enrich multinational film heritage. The COLLATE project focuses on the creation of a collaborative web-based multimedia environment with advanced tools for content access to multimedia film information in three national archives. Studies of users' current work context and work situation tasks and their needs for collaborative tools are an important research element in the development of the COLLATE collaboratory. Likewise, empirical evaluations of prototype tools in real life work environments are important elements in the development of innovative collaborative tools and methods that can be applied by the users to couple local resources in the archives with the global tools and opportunities offered by the COLLATE collaboratory. The present report has provided the results of a qualitative work domain analysis of the users' needs for the COLLATE collaboratory for film research, mediation and preservation. The aim of the present qualitative work domain analysis is to provide a basis for an iterative and participatory empirical evaluation of interface design, user acceptability and collaborative facilities of the COLLATE collaboratory.

The next phase of the empirical evaluation will address the COLLATE prototype in work (D9.2). The evaluation will consist of field experiments with archivist users working with the censorship case, in real life settings, as well as laboratory experiments with the advanced tools for text analysis, indexing, retrieval and annotation. The experiments will be based on task situation analysis for the censorship case in real life settings.

The first part of the next evaluation phase will focus on the collaboratory's opportunities for *knowledge acquisition* through subject analysis, indexing and annotation of censorship materials. Important themes include how the advanced indexing tools match the users' performance criteria for these activities, and how they can foster increasing *collaboration* among experts and users of the censorship materials stored in the collaboratory through collaborative *accessibility* of a COLLATE collaboratory and its working environment.

The second part of the next evaluation phase will focus on subject retrieval and interactive annotation of censorship materials. Important themes include how the advanced search and annotation tools match the users' performance criteria, and how they can contribute to enhancing the *quality* and effectiveness of work by providing access to materials and knowledge that are otherwise not accessible.

Finally, the next phase of the empirical evaluation will focus on *acceptability* of a collaboratory in the film domain by the professionals. This theme will be addressed through interviews with users on real-life experiences of collaborative work with the tools of the collaboratory.

12 References

Albrechtsen, H. ; E. Jacob (1998). The dynamics of classification schemes as boundary objects in electronic libraries. In: *Classification in the electronic environment*/edited by Geoffrey Bowker & Susan Leigh Star. Library Trends 47:2 Fall 1998, pp. 293-312 (background paper).

Allen, T.J. (1977). *Managing the flow of technology: technology transfer and the dissemination of technological information within the R&D organization*. Cambridge, MA: MIT Press.

Ardissono, L. ; Goy, A. (1999). Tailoring the interaction with users in electronic shops. In: J. Kay, ed. UM99*: User Modeling: Proceedings of the Seventh International Conference*. New York: Springer, 35-44.

Bhandarkar, M. …[et al.] (1999). BIOCORE: A collaboratory for structural biology. In Agostino G. Bruzzone …[et al.] editors. *Proceedings of the SCS International Conference on Web-Based Modeling and Simulation.* San Francisco: California, pp. 242-251.

Blair, D. C. ; Maron, M. E. (1985). An evaluation of retrieval effectiveness for a full-text document-retrieval system. *Communications of the ACM*, 28(3), pp. 289-299.

Bowker, G.C. ; S.L. Star (1999*). Sorting things out: classification and practice*. Cambridge (Mass): MIT Press.

Bucciarelli, L. L. (1987). *An ethnographic perspective on engineering design*. Cambridge, MA: MIT Press.

Cicourel, A.V. (1990). The integration of distributed knowledge in collaborative medical diagnosis. In: J. Galegher, R.E. Kraut, and C. Egido, eds. *Intellectual teamwork: social and technological foundations of cooperative work*. Hillsdale, NJ: Lawrence Erlbaum, 221-242.

Dunlop, M. D. ; McDonald, K. (2000). Supporting different search strategies in a video query interface. *Proceedings of the 6th RIAO (Recherche d'Informations Assistée par Ordinateur) Conference*, Paris, France, 12-14 April.

Ehn, P. (1989). *Work-Oriented Design of Computer Artifacts*. Stockholm, Sweden: Arbetslivscentrum.

Fidel, R., Bruce, H., Pejtersen, A. M., Dumais, S., Grudin, J., Poltrock, S. (2000). Collaborative information retrieval (CIR). *The New Review of Information Behaviour Research*, 1, 235-247.

Fidel, R. ; Davies, R.K. ; Douglass, M.H. ; Holder, J.K. ; Hopkins, C.J. ; Kushner, E.J. ; Miyagishima, B.K. ; Toney, C.D. (1999). A visit to the information mall: Web searching behavior of high school students. *Journal of the American Society of Information Science*, 50 (1), 24-37.

Fidel, R. ; Efthimiadis, Efthimis N. (1998) Content organization and retrieval project : phase I: A work-centered examination of web-searching behavior of Boeing engineers. Washington, the University of Washington.

Finholt, T. (2001). Collaboratories. In preparation for *Annual Review of Information Science and Technology*, vol 36 (2001).

Ford, J. M. ; Wood, L. E. (1996). An overview of ethnography and system design. In: D. Wixon and J. Ramey, (Eds.), *Field Methods Casebook for Software Design* pp. 269-282. New York: John Wiley and Sons.

Forsythe, D.E. ; Buchanan, B.G. ; Osherhoff, J.A. ;Miller, R.A. (1992). Expanding the concept of medical information: an observational study of physicians' information needs. *Computers and Biomedical Research*, 25 (2), 181-200.

Govindarej, T ; Pejtersen, A.M. ; P. Carstensen (1997): An information system based on empirical studies of engineering designers. In: *Computational Cybernetics and Simulation*. Vol.1. 1997 IEEE International Conference on Systems Man and Cybernetics, Orlando, Fl (US), 12-15 Oct. 1997 (IEEE, New York, NY, 1997), pp. 708-713.

Harrison, H., ed. (1991). *The FIAF cataloging rules for film archives*. New York: K.G. Saur. Papers and and reference tools for film archivists dealing with audiovisual material, vol. 1.

Hertzum, M. (1998). A Review of Museum Web Sites: In Search of User-Centred Design. *Archives and Museum Informatics*, 12(2), pp. 127-138.

Hertzum, M.; Pejtersen, A.M. (2000). The information-seeking practices of engineers: Searching for documents as well as for people. *Information Processing and Management* v. 36, (5), pp. 761-778.

Hudon, Michèle, (1997). Multilingual thesaurus construction : integration the views of different cultures in one gateway to knowledge and concepts. *Knowledge Organization*, v. 24, (2), pp. 84-91.

Jassawalla, A.R. ; Sashittal, H.C. (1999). Building collaborative cross-functional new product teams. *The Academy of Management Executives*, 13 (3), 50-63.

Jones, P. M. (1995). Designing for operations: Towards a sociotechnical systems and cognitive engineering approach to concurrent engineering. *International Journal of Industrial Ergonomics*, 16, pp. 283-292.

Karamuftuoglu, M. (1998). Collaborative information retrieval: toward a social informatics view of IR interaction. *Journal of the American Society for Information Science*, 49 (12), 1070-1080.

Kidd, A. (1994). The marks are on the knowledge worker. In: B. Adelson, S. Dumais, and J. Olson, eds. *Human Factors in Computing Systems: CHI'94 Conference Proceedings*. New York: ACM, 186-191.

Kling, R. ; Scacchi, W. (1982). The Web of Computing: Computer Technology as Social Organization. *Advances in Computers,* 21. Academic Press.

Kraemer, K. ; King, J. (1988). Computer-based systems for group decision support. *Computing Surveys*, 20 (2), 115-146.

Meadow, C. T. (1992). *Text information retrieval systems*. Academic Press, San Diego, California.

Miksa, F. (1999). *The DDC, the Universe of Knowledge, and the Post-Modern Library*. New York: Forest Press.

Opela, V. et al (1998). Czech Feature Film II, 1930-1945 (1998). Prague: National Film Archive.

Pejtersen, A.M. (1997) A cognitive engineering approach to cross disciplinary exploration of work domains and semantic information retrieval in communication networks. In: *Design of Computing Systems: Cognitive Considerations. Proceedings, Vol. 1.7. International Conference on Human-Computer interaction* (HCI International '97), San Francisco (CA), 24-29 Aug 1997. Salvendy, G.; Smith, M.J.; Koubek, R.J. (eds.), (Elsevier, Amsterdam (NL), 1997) (Advances in Human Factors/Ergonomics, 21A) p. 69-72.

Pejtersen, A.M. (1994). A Framework for Indexing and Representation of Information Based on Work Domain Analysis: a Fiction Classification Example. In: *Knowledge Organization and Quality Management*/edited by H. Albrechtsen & S. Ornager. - Frankfurt: Index Verlag, pp. 251-263

Pejtersen, A.M.(1991): Interfaces based on Associative Semantics for Browsing in Information retrieval. *Risoe report M-2794.* pp.143.

Pejtersen, A.M. (1988). Search strategies and database design for information retrieval in libraries. In: Goodstein, L.P. …[et al.] (Eds.) : *Tasks, errors and mental models*. London: Taylor and Francis, 1988.

Pejtersen, A.M. (1979). Investigation of search strategies in fiction based on analysis of 134 user-librarian conversations. *Proceedings of IPFIS3*, Oslo, Norway, pp. 107-132.

Pejtersen, A.M. (1980). Design of a Classification Scheme based on an Anslysis of Actual User Librarian Negotiations. In:Theory and Application of Information Research. Proceedings of the Second International Research Forum on Information Science. 3-6 August, 1977. Copenhagen. P. 146-160.

Pejtersen, A.M. ; H. Albrechtsen (2000): Ecological work-based classification schemes. In: *Dynamism and Stability in Knowledge Organization. Proceedings of the 6th International ISKO Conference*, Toronto, Canada, July 1-7 2000/edited by C. Beghtol & N. Williamson, pp. 97-110

Pejtersen, A.M ; Fidel, Raya. (1998). A framework for work centeret evaluation and design : a case study of ir on the web. In: *Working paper for MIRA workshop*, Grenoble, March.

Pejtersen, A. M., Sonnenwald, D. H., Buur, J., Govindaraj, T., & Vicente, K. (1997). The design explorer project: Using a cognitive framework to support knowledge exploration. *Journal of Engineering Design*, 8(3), 289-301.

Poltrock, S.E. ; Engelbeck, G. (1999). Requirements for a virtual collocation environment. *Information and Software Technology*, 41 (6), 331-339.

Poltrock, S.E. and Grudin, J. (1999). CSCW, Groupware and Workflow: Experiences, State of Art, and Future Trends. Tutorial presented at *CHI'99 Conference on Computer-Human Interaction*. ACM: New York.

Rasmussen, J. ; Pejtersen, A. M. ; Goodstein, L. P. (1994). *Cognitive systems engineering*. New York: John Wiley.

Resnick, P. ; Varian, H. R. (Eds.) (1997). Recommender Systems [Special issue], *Communications of the ACM*, 40 (3).

Romano, N.C., Jr. ; Nunamaker, J.F., Jr. ; Roussinov, D. ; Chen, H. (1999). Collaborative information retrieval environment: integration of information retrieval with group support systems. In: R. Sprague, R., ed. *Proceedings of the 32nd Hawaii International Conference on System Sciences*. Los Alamitos, CA: IEEE, pp. 1-10.

Schmidt, K. ; Simone, C. (1996). Coordination mechanisms: Towards a conceptual foundation of CSCW system design. *Computer Supported Cooperative Work: The Journal of Collaborative Computing*, 5, pp. 155-200.

Star, S.L. ; Griesemer, J. R. (1989). Institutional ecology, 'translations' and boundary objects: amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. *Social Studies of Science* 19, pp. 387-420.

Tabor, S.R. ; Faber, D.C. ; Meijerink, G. ; Duiker, S. (1998). The research - policy interface. In: S.R. Tabor and D.C. Faber, eds. *Closing the loop: from research on natural resources to policy change*. European Centre for Development Policy Management (Policy Management Report No. 8).

Teather, L., A museum is a museum is a museum… or is it?: Exploring museology and the web. In *Museums and the Web: An International Conference* (Pittsburgh, PA: Archives & Museum Informatics, 1998). http://www.archimuse.com/mw98/papers/teather/teather_paper.html (consulted 10 April 1999).

Theologus, G.C. (1969). *Development of a taxonomy of human performance: a review of biological taxonomy and classification*. Silver Springs: American Institutes for Research (Technical report AIR-726-12/69-TR-3).

Twidale, M.B. ; Nichols, D.M. ; Paice, C.D. (1997). Browsing is a collaborative process. *Information Processing & Management*, 33 (6), 761-783.

Whitley, R. D. (1983). From the sociology of scientific communities to the study of scientists' negotiations and beyond. *Social Science Information*, 22 (4-5), pp. 681-720.

Winograd, T. ; F. Flores (1986**)**. *Understanding Computers and Cognition* : A New Foundation for Design. New York: Addison-Wesley.

Bibliographic Data Sheet **Risø-R-1284 (EN)**

Title and author(s)

Web-Based - multimedia - Collaboratory

Empirical Work Studies in Film Archives

A.M. Pejtersen, H. Albrechtsen, B. Cleal, C.B. Hansen, M. Hertzum

ISBN	ISSN
87-550-2919-1; 87-550-2920-6 (internet)	0106-2840

Dept. or group	Date
System Analysis Department, SPM	June 2001

Groups own reg. number(s)	Project/contract no.
	IST-1999-20882

Pages	Tables	Illustrations	References
114	3	11	52

Abstract (Max. 2000 char.)

The Collaboratory for Annotation, Indexing and Retrieval of Digitized Historical Archive Material (Collate) is intended to foster and support collaboration on research, cultural mediation and preservation of films through a distributed multimedia repository. The tool will provide web-based tools and interfaces for collaborative work and content-based access to digital repositories for film archives, researchers and end-users. This report is based on empirical analysis of three film archives in Germany, Austria and the Czech Republic, and seeks to elicit the user needs for a collaboratory in this domain. Both the collection and analysis of data have been organised according to principles of Cognitive Work Analysis (CWA) as pioneered at Risø (cf. Rasmussen, Pejtersen & Goodstein1994). Research based work on individual film projects is, due to international distribution and multiple versions, dependent on collaboration with international colleagues who mediate access to their collections. Examining user-requests to the archives this report was able to draw on information collected by one of the archives relating to e-mail inquiries. Based on analysis of the raw data it proved possible to produce an analysis of the type of information requests that archives receive, the nature of the information they require and the kind of information they provide in terms of contextualising their interests. In this study there is an extra layer of complexity in that the focus is on three institutions, which, though located in the same work domain, are significantly different in their organisation. The approach adopted in this report is, therefore, one that seeks to suggest implications for the implementation of a collaboratory system according to the organisation of the archives.

Descriptors

COLLABORATORY, FILM ARCHIVES, MULTIMEDIA, FIELD STUDIES

Available on request from Information Service Department, Risø National Laboratory,
(Afdelingen for Informationsservice, Forskningscenter Risø),
P.O. Box 49, DK-4000 Roskilde, Denmark
Phone +45 46 77 46 77, ext. 4004/4005 - Telefax +45 46 77 4013