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## **Unlocking radio broadcasts**

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# Unlocking Radio Broadcasts: User Needs in Sound Retrieval

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## ABSTRACT

This poster reports the preliminary results of a user study uncovering the information seeking behaviour of humanities scholars dedicated to radio research. The study is part of an interdisciplinary research project on radio culture and auditory resources. The purpose of the study is to inform the design of information architecture and interaction design of a research infrastructure that will enable future radio and audio based research. Results from a questionnaire survey on humanities scholars' research interest and information needs, preferred access points, and indexing levels are reported. Finally, a flexible metadata schema is suggested, that includes both general metadata and highly media and research project specific metadata.

## Categories and Subject Descriptors

H.3.7 [Information Systems]: Digital Libraries – *User issues*.

## General Terms

Human Factors, Design.

## Keywords

User study, information search behavior, information seeking, access points, audio archives, radio broadcast, cultural heritage.

## 1. INTRODUCTION

Many countries are currently digitising their collections of cultural heritage objects. To scholars and researchers digitalisation initiatives provide new opportunities to access rich content primary sources. Digitalisation in the cultural heritage domain is, however, challenged by heterogeneous object types, that may have many different uses and call for different access points and metadata descriptions. Van den Bosch, van den Herik and Doorenbosch [1] describe how a new domain of interdisciplinary collaboration between computer scientists and the cultural heritage sector addresses the challenges in the access and use of cultural heritage resources. An example of such interdisciplinary collaboration is the LARM research project on

radio culture and auditory resources, which the present study is part of. The objective of the LARM research project is to develop a Danish national research infrastructure that will enable future radio and audio based research as well as knowledge dissemination, sharing and interaction between humanities researchers. Research on access to audio archives has focused mainly on systems and, e.g., the development of algorithms for automating the search process based on speech recognition [2]. The present study takes a user perspective, and the poster reports the preliminary results from a user study uncovering the information seeking behaviour of radio researchers. The purpose of the study is to inform the design of information architecture and interaction design, especially access points (metadata) and searching algorithm. The following research questions guided the study:

RQ1: What characterises information seeking behaviour of humanities scholars using radio broadcast as an information source?

RQ2: How can these characteristics of information seeking behaviour inform the information architecture and interaction design of the research infrastructure?

The present study can be seen as an answer to a call by Borgman [3], who points to a need to study the practices of digital humanities scholars in order to inform the design of scholarly infrastructure in the humanities. According to Borgman “[d]igital content, tools, and services all exist, but they are not necessarily useful or usable. Much work remains to build the scholarly infrastructure necessary for digital scholarship to become mainstream in the humanities” [3, section 67].

## 2. THE LARM RESEARCH PROJECT

Analogue collections constitutes the main part of Danish radio broadcast resources, and access is hampered by little or inconsistent metadata. The same challenges are reported in similar digitalisation projects [e.g., 4].

The main purpose of the LARM project is to establish a research infrastructure that will enable future radio and audio based research. As part of the project a digital archive is established with the appropriate tools to enable researchers to search and annotate the many recordings of the radiophonic cultural heritage, to interact and communicate about radio broadcasts. Content is provided by the Danish Broadcast Corporation (DR-ARC) and the State Media Collection (Statens Mediesamling) and by the end of the project the LARM Audio Research Archive will contain more than 1 million hours of national and local radio broadcasts from 1925 and onwards. Radio broadcast forms an invaluable source to Danish culture and history and the multidisciplinary project

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includes scholars from arts and cultural studies, literature, media studies, music studies, linguistics and sociolinguistics.

### 3. RELATED WORK

The assumption behind the present work is that in order to create enhanced access to digital audio archives, it is essential to improve our understanding of the information seeking behaviour of key user groups. As a next step, knowledge of information seeking behaviour can inform the design of the information architecture and interaction design of the research infrastructure. This assumption derives from the integrated approach to information seeking and retrieval outlined by [5]. The following section review related work on user needs in sound retrieval.

#### 3.1 User Needs in Sound Retrieval

As stated in the introduction research on access to audio archives has focused mainly on systems and, e.g., the development of algorithms for automating the search process based on speech recognition [2]. In an overview of techniques and trends in semantic speech retrieval Ordelman, de Jong and Larson [6] describe how speech-based indexing has been demonstrated most successfully in the broadcast news domain. Outside the broadcast news domain speech-based indexing has proven more difficult and they conclude that “[i]n particular speech recognition technology is helpful when it is used to support existing workflow steps, such as archivist keyword assignment, or enhance existing collections” [6, p. 528].

To the present authors’ knowledge only a very limited number of studies [2; 7] take a user perspective on access to audio archives. Kim et al. [2] report on an exploratory study of the criteria searchers use when judging the relevance of recorded speech from radio programs and the attributes of a recording on which those judgments are based. The small case study identified six relevance criteria (topicality, story genre, time frame, recency, listening time, and authority), - which have clear counterparts in text retrieval; however, the attributes used to assess those criteria differed in important ways. They conclude, that “[s]earching the spoken word imposes demands on both system and searcher that differ from those involved in searching the written word” [2, p. 338]. Recently, Huurnink et al. [7] studied media professionals’ use of an audiovisual archive through transaction log analysis. The results of the study show that (i) over half of the sessions were completed in less than 1 minute; (ii) nearly all of the queries contained a free text keyword search while almost a fourth specified a date filter. Program title was the most frequently occurring keyword search; (iii) the advanced search options was used in only 9% of the queries with media format and copyright owner as the most frequently specified metadata; (iv) finally, three different units of ordering was identified (programs, stories, and fragments) pointing to a need to address several indexing levels. The study by [7] took place within the context of a large broadcast archive containing both video and audio resources. They did not distinguish between the two media types, but the study revealed that less than 10% of the clicks and orders to the archive were for audio material. Accordingly, the results of the study must be skewed towards video as a media type. Therefore the results are not directly comparable to the results of the present study, but nevertheless considered relevant. The findings correspond to previous results concerning end-user searching that end-user searchers still make simple, short queries with few free-text search terms and little use of advanced features [8].

Whereas the user perspective has received little attention in the context of access to audio archives, several studies examine information needs and information seeking behavior in the context of moving images in audiovisual archives [e.g., 7; 9-11]. In summary, these studies add to our understanding of searching behavior in the context of moving images in audiovisual archives and the results clearly show media specific characteristics. This leads to the hypotheses that similar media specific characteristics apply in relation to radiophonic resources.

### 4. DATA COLLECTION

The user study was designed using a multi-method approach of 1) qualitative data from two LARM-research workshops, 2) analysis of LARM-researchers written descriptions of their research interests and derived information needs related to radio broadcasts, and 3) an online questionnaire. In the present poster we report findings from the questionnaire survey.

The online questionnaire was designed to provide detailed information on humanities scholars’ radio broadcast research interests, information needs, how they access and use radio broadcasts, preferred search entries, and use of other information sources. The design of the online questionnaire was informed by information gathered at the LARM research workshop. Especially the listing of 16 possible search entries was informed by input from scholars at the research workshops. The online questionnaire consisted of 16 questions and was designed to be completed in 10-15 minutes. The questionnaire was distributed in two steps. First, in November 2010 an invitation was sent by e-mails to the humanities scholars in the LARM project. The Danish language questionnaire was answered by 17 respondents, with a response rate of 65 percent. Respondents were Danish humanities scholars (from media studies, arts and cultural studies, communication design, music, and sociolinguistics) devoted to radio research. Secondly, in order to validate and strengthen the data, the questionnaire was translated to English and repeated amongst a purposive sample of 51 international humanities scholars in March 2012. The international survey was answered by 25 respondents, with a response rate of 49%. Across the two surveys respondents were aged between 31 and 69 with an average age of 48.9 years, and 26% of the respondents were female and 74% male.

In the next section we report preliminary results from the online survey. Although quantitative results are reported we stress that the study population is small and our findings may not be generalised to any overall population.

### 5. RESULTS

#### 5.1 Research interests and information needs

In order to understand humanities researchers’ work tasks related to use of audio archives, respondents were asked to describe their research interests. Examples are: radio, music, media, and cultural history; use of radio broadcast as a museum exhibit; web radio; radio jingles; language development; radiophonic idiom; and cultural studies (e.g., communication to and by the nuclear family, or change of national identity). The answers illustrate a rich variety of research perspectives on radiophonic cultural heritage. Further, they were asked to describe how they use radio broadcasts in connection with their research. A preliminary analysis indicates that information needs related to radio broadcasts can be linked to one of the following four main categories:

- Content elements (as a primary source material on, e.g., national identity or the nuclear family)
- Sound elements - either speech or music (as a primary source material on, e.g., linguistic or phonetic aspects of the Danish language).
- Broadcast elements (e.g., jingles, commercials, or interviews).
- Radio production and structure of programming elements

Further data analysis is necessary to elaborate the four categories and see how they correlate with preferred access points.

## 5.2 Preferred Search Interests

Survey respondents were asked to indicate the relevancy of 16 metadata as search entries. The 16 search entries are listed in Table 1 according to Hertzum's [9] classification of information need attributes. Overall questionnaire answers reflect a need for a variety of search entries.

We highlight the following two findings. Firstly, given the general research focus on optimizing speech recognition to improve access to audio archives [see 2; 6], it is interesting that subject-related metadata often are marked highly relevant as search entries by humanities scholars. More precisely, 48% of the respondents mark 'genre' as an highly relevant search entry, 45% mark 'topic'

**Table 1: Preferred search entries**

Survey question: Imagine that you have absolutely free hands to design a radio broadcast information retrieval system. Which of the information (or metadata) types listed below do you find relevant as search entries?	
Attribute	Finding radio programmes by:
Production related	Title Participants role (e.g. producer or host)
Screening related	Broadcast channel (e.g. BBC Radio 1) Recording technology (e.g., stereo, clearsound) Editing procedure (e.g. live or edited broadcast)
Content related	Abstract Named person Geographical location of recording (e.g. the City Hall Square in Copenhagen) Place of recording (e.g. indoor or outdoor) Broadcasts that contain specific elements (e.g. interviews, music, dialogue, speech)
Subject related	Genre (e.g. comedy or drama) Style (e.g. formal/informal, conversation, one-on-one interviews, panel debates) Topic (e.g. the Olympics 2012) Theme (e.g. EU referendums) Language style (e.g. spoken Danish in the 1920s)
Other	Programme ID-number

highly relevant, and 48% consider 'theme' highly relevant. The two remaining subject-related metadata are less often considered highly relevant. Subject-related metadata demands interpretation of the radio broadcast and thus cannot easily be extracted from speech recognition.

Secondly, the top-seven metadata marked 'relevant' and 'highly relevant' (broadcast channel, title, named person, genre, subject theme, abstract, and topic) all have clear counterparts in textual information retrieval. In contrast, the media specific metadata (such as recording technology, editing procedure, place of recording, and radio recordings reflecting a give language style) are considered less relevant by the majority of survey respondents. Further analysis of the questionnaire data indicates a clear connection between research interests and a need for highly media specific metadata as search entries. For example, a researcher in sociolinguistics marks "Finding radio programmes reflecting a given language style" as highly relevant (a search entry marked highly relevant by only 12% of the total respondents). The sociolinguistic researcher calls for further metadata on broadcast participants' social background, place of birth, place of living etc. Likewise, two other researchers in media studies and arts & cultural studies study radio jingles. They mark "Finding radio programmes that contain specific elements" as highly relevant and demand further differentiation of broadcast elements. In summary, we confirm the results by Kim et al. [2] stating that searching the spoken word differs from searching the written word in regard to important aspects. Here we point to the peculiarities of preferred search entries by humanities scholars in retrieval context. The identified characteristics suggest a demand for flexible metadata which will be further discussed in the concluding remarks section.

## 5.3 Indexing Level

Existing archival metadata available in the audio archive describes an entire broadcast. However, prior studies [e.g., 2; 7] of information behaviour of audiovisual archives' users show that users search for different units of material. Therefore survey respondents were asked to indicate what indexing level was important to them. Answers are depicted in Table 2 and show that most respondents (79%) search for a *specific radio programme*.

**Table 2: Survey respondents' indication of what unit of material is important to them (n = 42).**

This question regards indexing level. When you search for radio programmes, what is important for you to find?	#	%
A radio serial (e.g. The Lord of the Rings 1981 radio series)	26	62
A specific radio programme (e.g., the coronation of Queen Elizabeth II in 1953)	33	79
A part (or section) of a radio programme (e.g., a jingle, talk, or live transmissions part of a programme)	20	48
A textual description of a radio programme (e.g. radio schedules in magazines and newspapers)	24	57

This finding is closely related to the fact that 60% of the respondents find *title search* highly relevant as a search entry (see Table 1). Further, Table 2 shows that finding *a radio serial* or *a textual description of a radio programme* is important to 62% and 57% of the respondents respectively. Finally, 48% of the respondents find it important to locate a *part (or section) of a radio programme*. Overall the results in Table 2 support a need to address several indexing levels in audio archives and thereby enable access to broadcasts at different levels of granularity. The results also suggest that externally sourced descriptions from radio programme guides provide valuable information that cannot be extracted from the actual audio programmes.

## 6. CONCLUDING REMARKS AND FUTURE WORK

Based on both qualitative and quantitative data from a questionnaire survey, this poster draws preliminary characteristics of the information seeking behaviour of humanities scholars dedicated to radio research. The results show that humanities scholars' research interests cover a wide range of perspectives on radio broadcast, and that their information needs are related to one of four main categories: 1) content analysis, 2) aspects of sound – speech or music, 3) broadcast elements, and 4) radio production and structure of programming. Further, the analysis of preferred search entries shows that general metadata, with clear counterparts in textual information retrieval, are considered relevant by the majority of scholars. In contrast, the highly media specific metadata are considered less relevant by the majority, but nevertheless remains crucial to a few researcher. This, together with scholars' need to access radio broadcasts at different levels of granularity, leads us to suggest a flexible metadata schema in three levels:

- *Archival metadata* from the original archive (The Danish Broadcast Corporation or the State Media Collection). General metadata assigned to programme level includes: broadcast channel, program title, time of transmission, archival note, ID number, and person/corporate body.
- *LARM metadata* addresses general information needs by the LARM research scholars, and will be assigned to a subset of radio broadcasts by humanities scholars when they search and interact with the archive (e.g., genre, topic, persons, and related objects)
- *Project metadata* relates to specific research projects and facilitate a research group's annotation of radio broadcasts in their viewing and interpretation of the broadcast, and thus facilitating research analysis and communication.

The three metadata levels are complementary and are combined with flexible use of controlled vocabularies to support highly specific research interests.

Future work includes interactive information retrieval evaluation studies of how scholars search, annotate, reuse, share and access radio broadcasts. By taking a user perspective on access to audio archives, we answer a call by Borgman [3] and contribute to the design of a research infrastructure that is both useful and useable by humanities scholars.

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