

User-Centered Interface Design for Cross-Language Information Retrieval

Preben Hansen¹, Daniela Petrelli², Jussi Karlgren¹, Micheline Beaulieu², Mark Sanderson²

¹ Swedish Institute of Computer Science, Box 1263, SE-164 29 Kista, Sweden, +46 8 633 15 00
{preben,jussi}@sics.se

² University of Sheffield, 211 Portobello Street, Sheffield – S1 4DP – UK, +44 (0) 114 22 683
{d.petrelli,m.beaulieu,m.sanderson}@shef.ac.uk

ABSTRACT

This paper reports on the user-centered design methodology and techniques used for the elicitation of user requirements and how these requirements informed the first phase of the user interface design for a Cross-Language Information Retrieval System. We describe a set of factors involved in analysis of the data collected and, finally discuss the implications for user interface design based on the findings.

Categories and Subject Descriptors

H.3.3 [Information Search and Retrieval]; H.5.2 [User Interfaces]; I.2.7 [Natural Language Processing]

General Terms: Design, Human Factors, Languages.

Keywords: Cross-language information retrieval, user studies, interface design, requirement specification.

1. INTRODUCTION

Building tools to access multi-lingual collections of documents poses all the problems of tool design familiar from mono-lingual information access systems but adds several new issues. Cross language information retrieval systems allow users to retrieve documents written in one language using a query written in another (4): in general, people are able to read several more languages than they are able to formulate queries in. However, assessing the worth of documents in a foreign language is more complex than in one's first language – and building a system to present results in several languages is a complex design issue.

Retrieval effectiveness of cross-language systems has been studied through the application of established test collection approaches, (e.g. TREC and CLEF (1)) but comparatively few studies have addressed the specifics of how to design hospitable interfaces for information access in a multilingual environment.

A cross-lingual interface should provide the user with integrated support for all those information access tasks in the search process that are changed through the introduction of multiple languages: e.g. query formulation and reformulation, relevance assessment, document selection, obtaining a collection overview (3).

The goal of this field study was to observe current practice on how real cross-language tasks are accomplished through monolingual tools in order to understand what is needed to fully support multi-language information handling tasks.

2. USER-CENTERED DESIGN

Designing with a user-centered approach requires that the user be involved from the very beginning. It is important to integrate user's expertise and knowledge and to understand what people are doing, how, when, and why. There are varied sets of techniques that may be applied for this purpose (2). Generally, elaborating on the outcome of the knowledge acquisition phase, designers define a first version of the system using techniques like task analysis or scenarios of use. Promising solutions can then be tested with users. This formative evaluation verifies choices and indicates design revisions. The design cycle ends when a satisfying solution is reached and implemented. The prototype generated at this stage should be close to the final system and is tested in a summative evaluation to detect minor problems.

We realized the first part of this user-centered design cycle following the steps below:

1. *Preliminary requirements specification:* informal initial definition of user needs together with experts.
2. *Scenarios and preliminary design phase:* based on the results from the previous stage, **proposed scenarios** are created.
3. *Formative evaluation:* the proposed scenarios are used to design a **mock-up user interface**, for user judgment.
4. *Detailed requirements specification:* direct observation of users in real work situations performing real tasks in real environments for detailed information gathering.
5. *Main design phase:* integration of outcome from the previous step resulting in a revision of the first mock-ups.

2.1 CLIR User-Interface Proposal

The initial interface layout was based on proposed scenarios (2 above) formulated by designers taking into account advices coming from representatives of the user's and consisted of 6 individual panes: a *system set-up* pane; a *query formulation and translation* pane; a *result overview* pane of the retrieved set; a ranked list in a *result presentation* pane for relevance judgment; a *multi-document inspection* pane which provides a concurrent display of several documents; and finally, a *search working area* pane for keeping track of searches, query strings and terms and documents.

2.2 The Field Study

Two sites were involved: Alma Media, Finland, and BBC Monitoring, UK. A total of 10 subjects participated representing 4 different user categories: a business analyst, a journalist, 3 librarians, and 5 translators. In order to obtain a rich picture about users and tasks, we applied a combination of qualitative and quantitative data collection techniques.

The study was set-up with the purpose of collecting information on a) *Potential users*: characteristics, needs and desires, opinions; b) *Different tasks*: goals, workflows, current practices; and c) *Environments of use*: desktop or remote access, collaboration in information seeking. The field study focused on four data collection activities of users searching for cross-lingual information:

1. Real time user-task observation and interview through direct observation in their actual work environment;
2. "Informal tests" viewing the interaction with a CLIR system available on the Web (ARCTOS) and machine-translated web pages (Google). This collection of user feedback revealed further details about user characteristics and the way they perform search tasks;
3. Quantitative data were collected through questionnaires in order to sample a larger population;
4. End-user participatory design sessions were undertaken in order to evaluate and discuss the interface mock-ups and design choices.

With one minor exception, all the field study sessions were video recorded. The video evidence provided a valuable support for data analysis, but direct observation by the researchers and first hand interpretation recorded in real time together with note taking proved to be very valuable.

2.3 Data Analysis Approach

All data collection sessions were analyzed according to the following list of factors: *Goals* (the user's information seeking objective); *Tasks* (a set of actions done for a purpose); *Acts* (a single atomic action or move); *Community context* (e.g. interaction between people); *Procedures* (responses to certain situations); *Design implications* (user suggested improvements); and *Opinions* (user expressed opinions or preferences).

Exploiting the videos generated lists of factual observations, which were organized following the sequence of the observed users' tasks ("task-flows") and translated into task scenarios, which provided a detailed description of each of the user profiles, goals, information task performance, and environment as well as individual requirements. Together with the observation notes, the scenarios served to identify key factors for system design. The following list of user requirements related to CLIR was derived:

1. Search multiple languages at the same time
2. Change query language in same search session
3. Support multilingual queries
4. Support queries with compound names and phrases
5. Use lexical and morphological tools, such as synonym lists

6. Combine Boolean and ranked retrieval
7. Filter results by language, genre, date, or other features
8. Create user-specific dictionaries and term lists

2.4 Implication For System Design

The user requirements list above can be divided with respect to the influence over different software module(s) of the system: a) the user interface (points 2, 7, 8 above); b) generic mechanism of information retrieval (4, 5, and 6), and c) specific for the cross-language task (1 and 3). The strongest impact of the user field study was on the user interface. One important finding related to the amount of control a user required over the *translation process*. They were primarily concerned with the actual search outcome and user control only became an issue when subjects encountered problems in getting satisfactory results. Another major result that called for redesign was related to the *ranked list*. Users expected the result of their search to be presented in a ranked order. Consequently, a graphical overview of the results was set aside in the first design stage. The *presentation of information* for each item in the ranked list was also subject for revision.

3. CONCLUSIONS

By observing current practices with monolingual search engines, we were able to make an advance in assessing what support users would require in a cross-language information retrieval search. The findings led to the redesign of a number of different components of the user interface: in several cases sufficient evidence was gathered to suggest a sound solution. The redesigned interface will be implemented in the near future and will undergo further iteration of the design-evaluation cycle.

4. ACKNOWLEDGEMENTS

This work has been done in Clarity, a EU founded project. Partners participating are: Alma Media, Finland; BBC Monitoring, UK; Swedish Institute of Computer Science, Sweden; University of Sheffield, UK, and University of Tampere, Finland.

5. REFERENCES

- [1] Braschler, M., Peters, C. and Schäuble, P. Cross language information retrieval (CLIR) track overview. In: Voorhees, E.M. and Harman, D. K. (eds.), *(TREC-8)*. Gaithersburg, MD: National Institute of Standards and Technology, 2000, pp. 25-33.
- [2] Hackos, J. T. and Redish, J. C., *User and task analysis for interface design*. Wiley, 1998.
- [3] Ogden, W. C. and Davis, M.W. Improving cross-language text retrieval with human interactions, *Proceedings of the Hawaii International Conference on System Science – HICSS-33*, 2000
- [4] Pirkola, A. The effects of query structure and dictionary setups in dictionary-based cross-lingual information retrieval. In: *Proceedings of the ACM SIGIR 1998*, Melbourne: Australia, August 1998, 55-64