



A Survey of Users and Their Use of Information in Different Languages

User Report

Erin Larucci

elarucci@gmail.com



Table of Contents

Executive Summary	2
Documents	3
Previously Reported Documents	16
Appendix A - Concept Outline	21
Appendix B - Queries	22

Executive Summary

To: Dr. Jianqiang Wang
From: Erin Larucci
Subject: A Survey of Users and Their Use of Information in Different Languages
Date: December 10, 2012
CC: LIS 566 - Digital Information Retrieval

Attached please find citations and abstracts for documents relating to users and how they use information in foreign languages. I used a wide variety of databases and search engines to find relevant documents. These are detailed in an appendix along with search terms and queries used (and their effectiveness) in retrieving documents. The queries in Revision 1 and Revision 3 were the most successful in identifying relevant documents.

There are some articles that are “possibly relevant”; these are indicated with a blue font. Hyperlinks have been included where applicable for your convenience. The section that contains “previously reported documents” is a copy of the Revision 1 query results I sent to you on October 27; I included them here so you have all the documents in one place. (All documents retrieved from the preliminary search have been omitted as they were not relevant.)

Throughout the course of searching, I found the following search terms (and their variants) to be the most helpful in locating relevant documents:

User study

Multilingual information access

I was unfortunately unable to find a good quantity of documents in news or multimedia (there is one full-text news item included). The Revision 2 queries focused on searching for news and multimedia; they were not successful. The majority of documents are therefore scholarly articles. I do not think my search terms were conducive to finding older articles (due to advances in technology, the terminology might not be relevant to older documents); most of the documents retrieved date within the past fifteen years.

Please let me know if there is any way I can further assist you with this project. I would be more than willing to continue working on it if it would be helpful to you.

Documents

1 - Hover, P.L. (2009). "Sentences like these:" Multicultural information dynamics and international diversity of thought. *International information & library review*, 41(3). P196-218. DOI: 10.1016/j.iilr.2009.07.002

Abstract:

Multicultural information dynamics is exploratory cross-cultural research of the information-seeking behavior of a group of eighty-four Egyptian and American reference librarians asked to choose from websites in different languages. This paper, the fourth in a series, focuses on national, monolingual, and multilingual subgroups, and provides multi-tiered analyzes of websites clicked, reasons given for clicking, preferences for machine translations vs. original foreign language websites, decision making when choosing non-native language hits, and foreign language anxiety. Findings of the research show that information seekers of both nationalities are reluctant to cross cultural lines at the basic level of retrieved Internet information hits. Further results delineate differences and similarities in motivations, circumstantial preferences for original languages or machine translations, and comparative information-seeking behavior of subgroups. The research has implications for improving search performance in the fields of global knowledge dissemination via website and search engine design, library science, and international scholarship.

2 - Wu, D., He, D., Xu, X., (2012). A study of relevance feedback techniques in interactive multilingual information access. *Library hi tech*, 30(3). P523-544. DOI: 10.1108/07378831211266645

Abstract:

Purpose – With the vast amount of multilingual information available online, it becomes increasingly critical for libraries to use various multilingual information access techniques in order to effectively support patrons' online information requests. However, this is still a relatively under-explored area. This paper aims to study the effectiveness and the adoptability of query expansion and translation enhancement in the context of interactive multilingual information access. Design/methodology/approach – Relying on an interactive multilingual information access system called ICE-TEA, the authors conducted a controlled experiment (English-to-Chinese translation) involving human subjects to assess the retrieval effectiveness, analyzed the collected search logs to examine users' behavior, and employed pre- and post-questionnaires to obtain users' opinions about the system. Findings – The results confirm that significant improvement in retrieval effectiveness can be achieved by combining query expansion with translation enhancement (as compared to a case when there is no relevance feedback). However, users' ability to understand, interact with and even perceive the complex process of searches involving the combination of query expansion and translation enhancement may greatly impact the effectiveness of the techniques. The results also confirm that human-

generated queries were short queries, which calls for careful consideration of how longer queries perform in real search because many search engines rely on longer and more complex queries. Originality/value – This study examines two important relevance feedback techniques in the context of human-involved multilingual information access. This study is a valuable addition to the information seeking behaviour literature.

3 - Berendt, B., Kralisch, A. (2009). A user-centric approach to identifying best deployment strategies for language tools: the impact of content and access language on Web user behaviour and attitudes. *Information retrieval*, 12(3). P380-399. DOI: 10.1007/s10791-008-9086-4

Abstract:

The number of Web users whose first language is not English continues to grow, as does the amount of content provided in languages other than English. This poses new challenges for actors on the Web, such as in which language(s) content should be offered, how search tools should deal with mono- and multilingual content, and how users can make the best use of navigation and search options, suited to their individual linguistic skills. How should these challenges be dealt with? Technological approaches to non-English (or in general, cross-language) Web search have made large progress; however, translation remains a hard problem. This precludes a low-cost but high-quality blanket all-language coverage of the whole Web. In this paper, we propose a user-centric approach to answering questions of where to best concentrate efforts and investments. Drawing on linguistic research, we describe data on the availability of content and access to it in first and second languages across the Web. We then present three studies that investigated the impact of the availability (or not) of first-language content and access forms on user behaviour and attitudes. The results indicate that non-English languages are under-represented on the Web and that this is partly due to content-creation, link-setting and link-following behaviour. They also show that user satisfaction is influenced both by the cognitive effort of searching and the availability of alternative information in that language. These findings suggest that more cross-language tools are desirable. However, they also indicate that context (such as user groups' domain expertise or site type) should be considered when tradeoffs between information quality and multilinguality need to be taken into account.

4 - Bilal, D., Bachir, I. (2007). Children's interaction with cross-cultural and multilingual digital libraries. II. Information seeking, success, and affective experience. *Information processing & management*, 43(1). P65-80. 10.1016/j.ipm.2006.05.008

Abstract:

This paper reports the results of a study that investigated Arabic-speaking children's interaction with the International Children's Digital Library (ICDL) to find Arabic books on four tasks. Children's information seeking activities was captured by using HyperCam software. Children's success was assessed based on a measure the researchers developed. Children's perceptions of and affective experience in using the ICDL was gathered through group interviews. Findings revealed that children's information seeking behavior was characterized by browsing using a single function; that is, looking under "Arabic" from the Simple interface pull-down menu.

Children were more successful on the fully self-generated, open-ended task than on the assigned and semi-assigned tasks. Children made suggestions for improving the Arabic collection and the design of the ICDL. The findings have implications for practitioners, researchers, and system designers.

5 - Vanopstal, K., Stichele, R.V., Laureys, G., Buyschaert, J. (2012). PubMed searches by Dutch-speaking nursing students: The impact of language and system experience. *Journal of the American society for information science & technology*, 63(8). DOI: P1538-1552. 10.1002/asi.22694

Abstract:

This study analyzes the search behavior of Dutch-speaking nursing students with a nonnative knowledge of English who searched for information in MEDLINE/ PubMed about a specific theme in nursing. We examine whether and to what extent their search efficiency is affected by their language skills. Our task-oriented approach focuses on three stages of the information retrieval process: need articulation, query formulation, and relevance judgment. The test participants completed a pretest questionnaire, which gave us information about their overall experience with the search system and their self-reported computer and language skills. The students were briefly introduced to the use of PubMed and MeSH (medical subject headings) before they conducted their keyword-driven subject search. We assessed the search results in terms of recall and precision, and also analyzed the search process. After the search task, a satisfaction survey and a language test were completed. We conclude that language skills have an impact on the search results. We hypothesize that language support might improve the efficiency of searches conducted by Dutch-speaking users of PubMed.

6 - Clough, P., Sanderson, M. (2006). User experiments with the Eurovision cross-language image retrieval system. *Journal of the American society for information science & technology*, 57(5). P697-708. DOI: 10.1002/asi.20331

Abstract:

In this article the authors present Eurovision, a text-based system for cross-language (CL) image retrieval. The system is evaluated by multilingual users for two search tasks with the system configured in English and five other languages. To the authors' knowledge, this is the first published set of user experiments for CL image retrieval. They show that (a) it is possible to create a usable multilingual search engine using little knowledge of any language other than English, (b) categorizing images assists the user's search, and (c) there are differences in the way users search between the proposed search tasks. Based on the two search tasks and user feedback, they describe important aspects of any CL image retrieval system.

7 - Orengo, V.M., Huyck, C. (2006). Relevance feedback and cross-language information retrieval. *Information processing & Management*, 42(5). P1203-1217. DOI: 10.1016/j.ipm.2005.12.003

Abstract:

This paper presents a study of relevance feedback in a cross-language information retrieval environment. We have performed an experiment in which Portuguese speakers are asked to judge the relevance of English documents; documents hand-translated to Portuguese and documents automatically translated to Portuguese. The goals of the experiment were to answer two questions (i) how well can native Portuguese searchers recognise relevant documents written in English, compared to documents that are hand translated and automatically translated to Portuguese; and (ii) what is the impact of misjudged documents on the performance improvement that can be achieved by relevance feedback. Surprisingly, the results show that machine translation is as effective as hand translation in aiding users to assess relevance in the experiment. In addition, the impact of misjudged documents on the performance of RF is overall just moderate, and varies greatly for different query topics.

8 - Jialun, Q., Yilu, Z., Michael, C., Hsinchun, C. (2006). Multilingual Web retrieval: An experiment in English–Chinese business intelligence. *Journal of the American society for information science & technology*, 57(5). P671-683. [no DOI]

Abstract:

As increasing numbers of non-English resources have become available on the Web, the interesting and important issue of how Web users can retrieve documents in different languages has arisen. Cross-language information retrieval (CLIR), the study of retrieving information in one language by queries expressed in another language, is a promising approach to the problem. Cross-language information retrieval has attracted much attention in recent years. Most research systems have achieved satisfactory performance on standard Text REtrieval Conference (TREC) collections such as news articles, but CLIR techniques have not been widely studied and evaluated for applications such as Web portals. In this article, the authors present their research in developing and evaluating a multilingual English–Chinese Web portal that incorporates various CLIR techniques for use in the business domain. A dictionary-based approach was adopted and combines phrasal translation, co-occurrence analysis, and pre- and posttranslation query expansion. The portal was evaluated by domain experts, using a set of queries in both English and Chinese. The experimental results showed that co-occurrence-based phrasal translation achieved a 74.6% improvement in precision over simple word-by-word translation. When used together, pre- and posttranslation query expansion improved the performance slightly, achieving a 78.0% improvement over the baseline word-by-word translation approach. In general, applying CLIR techniques in Web applications shows promise.

9 - Petrelli, D., Beaulieu, M., Sanderson, M., Demetriou, G., Herring, P., Hansen, P. (2004). Observing Users, Designing Clarity: A Case Study on the User-Centered Design of a Cross-Language Information Retrieval System. *Journal for the American society for information science & technology*, 55(10). P923-934. DOI: 10.1002/asi.20036

Abstract:

Cross-language information retrieval (CUR) is the retrieval of information written in one language based on a query expressed in another, e.g., typing a query in English to retrieve

documents written in Finnish. For such a process to succeed, both translation and retrieval must be conducted in order to locate relevant items. Early research showed that CUR was feasible but its effectiveness was lower than that of monolingual retrieval. With the establishment of a TREC track in CUR, which led to a series of collaborative cross-language efforts in Europe and Japan, retrieval of information written in a language different from the language of the query was researched more widely. A study involving users from the beginning of the design process is described, and it covers initial examination of user needs and tasks, preliminary design and testing of interface components, building, testing, and refining the interface, and, finally, conducting usability tests of the system. user-centered design approach to lead the development of a CUR system, called Clarity, toward its first stable prototype.

10 - Petrelli, D., Levin, S., Beaulieu, M., Sanderson, M. (2006). Which user interaction for cross-language information retrieval? Design issues and reflections. *Journal for the American society for information science & technology*, 57(5). P709-722. DOI: 10.1002/asi.20332

Abstract:

novel and complex form of information access is cross-language information retrieval: searching for texts written in foreign languages based on native language queries. Although the underlying technology for achieving such a search is relatively well understood, the appropriate interface design is not. The authors present three user evaluations undertaken during the iterative design of Clarity, a cross-language retrieval system for low-density languages, and shows how the user-interaction design evolved depending on the results of usability tests. The first test was instrumental to identify weaknesses in both functionalities and interface; the second was run to determine if query translation should be shown or not; the final was a global assessment and focused on user satisfaction criteria. Lessons were learned at every stage of the process leading to a much more informed view of what a cross-language retrieval system should offer to users.

11 - Al-Eroud, A., Al-Ramahi, M.A., Al-Kabi, M., Alsmadi, I.M., Al-Shawafa, E.M. (2011). Evaluating Google queries based on language preferences. *Journal of information science*, 37(3). P282-292. DOI: 10.1177/0165551511403383

Abstract:

This paper evaluates the assumption that users expect search engines to retrieve the same results for queries regardless of the language or the location of the originator. The dependency of the Google search engine on the language and location from which the query is submitted has been evaluated. The most popular queries in Arabic language were selected and translated into English for comparison using the Google translator. When studying keyword traffic on both Google search based keyword tool and Google Insights for Search, results showed that 67% of the Arab Internet users prefer to use English queries instead of their Arabic counterpart. When studying Google responses to some popular queries we have found that Google ranking algorithm depends on the language of the query more than on the keyword popularity. Although results justify search engines' favouritism of giving documents in English priority over those of other languages, nonetheless, future search engine indexers should separate the document language

from its content in a structure that makes the language a pluggable attribute for those indexed documents.

12 - Airio, E. (2008). Who benefits from CLIR in web retrieval? *Journal of documentation*, 64(5). P760-778. [no DOI]

Abstract:

Purpose - The aim of the current paper is to test whether query translation is beneficial in web retrieval. Design/methodology/approach - The language pairs were Finnish-Swedish, English-German and Finnish-French. A total of 12-18 participants were recruited for each language pair. Each participant performed four retrieval tasks. The author's aim was to compare the performance of the translated queries with that of the target language queries. Thus, the author asked participants to formulate a source language query and a target language query for each task. The source language queries were translated into the target language utilizing a dictionary-based system. In English-German, also machine translation was utilized. The author used Google as the search engine. Findings - The results differed depending on the language pair. The author concluded that the dictionary coverage had an effect on the results. On average, the results of query-translation were better than in the traditional laboratory tests. Originality/value - This research shows that query translation in web is beneficial especially for users with moderate and non-active language skills. This is valuable information for developers of cross-language information retrieval systems.

13 - Nzomo, P., Rubin, V.L., Ajiferuke, I. (2012). Multi-lingual information access tools: user survey. *ACM: iConference '12: Proceedings of th 2012 iConference*. P530-532. DOI: 10.1145/2132176.2132276

Abstract:

This research presents the results of a case study on potential users of Cross Language Information Retrieval (CLIR) systems --- international students at a Canadian University. The study is designed to test their awareness of Multi-Lingual Information Access (MLIA) tools on the internet and in select electronic databases. The study investigates how non-native English speakers cope with language barriers while searching for information online. We advocate for designing systems that incorporate CLIR options and other MLIA tools to support users from diverse linguistic backgrounds with varying proficiency levels.

14 - Zhang, P., Plettenberg, L., Klavans, J.L., Oard, D.W., Soergel, D. (2007). Task-based interaction with an integrated multilingual, multimedia information system: a formative evaluation. *ACM: JCDL '07 Proceedings of the 7th ACM/IEEE-CS joint conference on digital libraries*. P117-126. DOI: 10.1145/1255175.1255199

Abstract:

This paper describes a formative evaluation of an integrated multilingual, multimedia information system, a series of user studies designed to guide system development. The system

includes automatic speech recognition for English, Chinese, and Arabic, automatic translation from Chinese and Arabic into English, and query-based and profile-based search options. The study design emphasizes repeated evaluation with the same (increasingly experienced) participants, exploration of alternative task designs, rich qualitative and quantitative data collection, and rapid analysis to provide the timely feedback needed to support iterative and responsive development. Results indicate that users presented with materials in a language that they do not know can generate remarkably useful work products, but that integration of transcription, translation, search and profile management poses challenges that would be less evident were each technology to be evaluated in isolation.

15 - Jozsa, E., Koles, M., Komlodi, A., Hercegf, K., Chu, P. (2012). Evaluation of search quality differences and the impact of personality styles in native and foreign language searching tasks. *ACM: IIX '12 Proceedings of the 4th information interaction in context symposium*. P310-313. DOI: 10.1145/2362724.2362782

Abstract:

Taking individual differences into consideration is a foundational issue of Human-Computer Interaction research. The current paper examines the differences that arise during native and foreign language information-seeking tasks. Seventeen Hungarian college students, with significant but non-heritage knowledge of English, participated in the study. We examined the impact of search strategies and personality types on search outcome quality. Our results show interesting variations in searchers' success in their native and foreign languages. In-depth search strategies work better and allow searchers to achieve the same success rate in a foreign language as in their native language. More empathy toward the search task also seems to improve results.

16 - Marlow, J, Cough, P., Recuero, J.C., Artiles, J. (2008). Exploring the effects of language skills on multilingual web search. *ACM: ECIR'08 Proceeding of the IR research, 30th European conference on advance in information retrieval*. P126-137. [no DOI]

Abstract:

Multilingual access is an important area of research, especially given the growth in multilingual users of online resources. A large body of research exists for Cross-Language Information Retrieval (CLIR); however, little of this work has considered the language skills of the end user, a critical factor in providing effective multilingual search functionality. In this paper we describe an experiment carried out to further understand the effects of language skills on multilingual search. Using the Google Translate service, we show that users have varied language skills that are non-trivial to assess and can impact their multilingual searching experience and search effectiveness.

17 - Stiller, J. (2010). Leveraging user interaction and collaboration for improving multilingual information access in digital libraries. *ACM: SIGIR '10 Proceeding of the 33rd international ACM SIGIR conference on research and development in information retrieval*. P916-916. DOI: 10.1145/1835449.1835689

Abstract:

The goal of interactive cross-lingual information retrieval systems is to support users in formulating effective queries and selecting the documents which satisfy their information needs regardless of the language of these documents. This dissertation aims at harnessing user-system interaction, extracting the added value and integrating it back into the system to improve cross-lingual information retrieval for successive users. To achieve this, user input at different interaction points will be evaluated. This will, among others, include interaction during user-assisted query translations, implicit and explicit relevance feedback and social tags. To leverage this input, explorative studies need to be conducted to determine beneficial user input and the methods of extracting it.

18 - Wu, D., Luo, B., He, D. (2010). How Multilingual Digital Information Is Used: A Study in Chinese Academic Libraries. *IEEE: 2010 International conference on management and service science (MASS 2010)*. [no pages] DOI: 10.1109/ICMSS.2010.5576827

Abstract:

Digital library, because of its resource demanding and other issues to solve, is an important application of multilingual information access (MLIA). However, the requirements of MLIA systems and applications are not typically addressed or assessed in our evaluations of digital libraries. This paper, therefore, aims to study the usages of MLIA in Chinese academic digital libraries. We conducted some surveys to study MLIA in current Chinese academic digital libraries and to get to know the users' real requirements for MLIA in Chinese academic digital libraries. The initial results offer thoughts on specific MLIA functions and insights on future digital library design and developments.

19 - Rieh, H.Y., Rieh, S.Y. (2005). Web searching across languages: preference and behavior of bilingual academic users in Korea. *Library & information science research*, 27(2). P249-263. DOI: 10.1016/j.lisr.2005.01.006

Abstract:

The problem of language in Web searching has been discussed primarily in the area of cross-language information retrieval (CLIR). However, much CLIR research centers on investigation of the effectiveness of automatic translation techniques. The case study reported here explored bilingual user behaviors, perceptions, and preferences with respect to the capability of the Web as a multilingual information resource. Twenty-eight bilingual academic users from Myongji University in Korea were recruited for the study. Findings show that the subjects did not use Web search engines as multilingual tools. For search queries, they selected a language that represents their information need most accurately depending on the types of information task rather than choosing their first language. Subjects expressed concerns about the accuracy of machine translation of scholarly terminologies and preferred to have user control over multilingual Web searches.

20 - Wu, Y.C., Chang, C.H., Lee, Y.S. (2004). CLVQ: cross-language video question/answering system. *IEEE: Proceedings to sixth international symposium on multimedia software*. [no pages] [no DOI]

Abstract:

Multilanguage information retrieval promotes users to browse documents in the form of their mother language, and more and more peoples interested in retrieves short answers rather than a full document. In this paper, we present a cross-language video QA system i.e. CLVQ, which could process the English questions, and find answers in Chinese videos. The main contribution of this research are: (1) the application of QA technology into different media; and (2) adopt a new answer finding approach without human-made rules; (3) the combination of several techniques of passage retrieval algorithms. The experimental result shows 56% of answer finding. The testing collection was consists of six discovery movies, and questions are from the School of Discovery Web site.

21 - Berry, M.W., Young, P.G. (1995). Using latent semantic indexing for multilanguage information retrieval. *Computers and the humanities*, 29(6). P413-429. [no DOI]

Abstract:

A method for indexing cross-language databases for conceptual query matching is presented. Two languages (Greek and English) are combined by appending a small portion of documents from one language to the identical documents in the other language. The proposed merging strategy duplicates less than 7% of the entire database (made up of different translations of the Gospels). Previous strategies duplicated up to 34% of the initial database in order to perform the merger. The proposed method retrieves a larger number of relevant documents for both languages with higher cosine rankings when latent semantic indexing (LSI) is employed. Using the proposed merge strategies, LSI is shown to be effective in retrieving documents from either language (Greek or English) without requiring any translation of a user's query. An effective Bible search product needs to allow the use of natural language for searching (queries). LSI enables the user to form queries with using natural expressions in the user's own native language. The merging strategy proposed in this study enables LSI to retrieve relevant documents effectively using a minimum of the database in a foreign language.

22 - Ha, Y.J. (2008). Accessing and using multilanguage information by users searching in different information retrieval systems. *Dissertations abstracts international, Vol. 7008A*. p2784 (255 pages). [no DOI]

Abstract:

There is an underlying assumption in the exchange of scholarly information that knowledge will be transferred across country borders, cultures, and languages. It is this sharing of scholarly information is considered an essential pre-requisite necessary for the advancement of knowledge. Nonetheless, in the current English dominant environment of information retrieval (IR) systems, there are numerous obstacles confronting users who seek to access and use non-English

information.

The purposes of this study are: to explore the information behaviors of those seeking non-English information; to identify difficulties of individuals' experiences when accessing and using non-English information in current IR systems; to develop an explanatory model determining how person characteristics, experiential knowledge, and situation factors influence search behaviors and evaluations of bibliographic information.

Two separate studies are conducted to explore the above issues: an online questionnaire of users of multilanguage information retrieval systems; and an experiment with individuals accessing information on different topics using different languages and systems. The participants in these studies include academic researchers and library personnel and are individuals who regularly interact with Chinese, Japanese, Korean and English records via IR systems.

The survey and experiment participants note the lack of non-English access via indexing terms, the lack of non-English records in major online databases which index journals, the lack of English translation of abstracts, and the lack of coherent and understandable access to non-Roman language materials. The users of non-English information expect to have a system with cross language information retrieval functions providing clear access to full text non-English information. Importantly, having understandable bibliographic records are essential when individuals make decisions on their expected use of non-English documents.

The experiment data analyses reveal there are different IR system search behaviors by subjects' with different language backgrounds, professions, language knowledge, topic knowledge and its target language, especially comparing English with non-English searches. An explanatory model for non-English searching model was built based on various statistical analyses of experiment data. The model depicts the importance of statistically significant relationships among person characteristics and experiential knowledge which explain search behaviors and intention to use retrieved information when individuals seek non-English/non-Roman alphabet information.

NEWS:

23 - Giussani, B. (1997). *Searching the net, continental style*. New York Times, Eurobytes. May 13, 1997. <http://partners.nytimes.com/library/cyber/euro/051397euro.html>

GENEVA -- "Oh, you don't want to know that," said Danny Froeberg, president of Euroseek, a new European search engine based in Sweden.

I do. "Sex, of course," Froeberg answered.

"Sesso," said Riccardo Vratogna, head of Italy's Shinyseek.

"Sorry to confirm a cliché, but it is 'sexe'," Christophe Ruelle, director of development at France's Echo, added.

"Sex" and its variations, like "porn" or "nude," are definitely the words most often entered into European Internet search engines, much the same as in the United States, indeed -- check out the Search Voyeur site or Shinyseek's Top50 section if you think this is just a reporter's hunch.

So what's the big deal?

"Language is the big deal -- and cultural patterns," Denis Jamet, the producer of Yahoo! France, answered. Europeans may be as interested in sex online as Americans, but they want it in words they understand.

Forget sex for a moment, and consider this: until recently, European Internet users looking for information on French movies or Italian eyeglass manufacturers had to tap into American search engines and resource catalogues. (A survey conducted last year by IDC in 16 European countries ranked Digital Equipment Corp.'s Altavista as the most popular, with 35 percent of the users quoting it, while Yahoo! scored 32 percent).

Because such directories are often used as starting points, this helped to establish the idea that when it comes to the Internet, "If you don't speak English, don't bother buying a modem." And even users who master enough English to understand the search instructions have often been frustrated by the search engines' inability to correctly handle other language's characteristics, like accents, cedillas and diereses.

Besides the high cost of telecommunications (local phone calls can cost up to \$7 an hour), language has probably been the most important single factor slowing down the adoption of the Internet in Europe.

But as the number of European (and non-English) Web pages shoot up, the need to find and sort through them quickly becomes crucial. There are today an estimated 12 to 15 million Internet users in Europe and hundreds of new Web sites going live every day in three dozen different languages, from Dutch to Russian.

By the end of 1995, some local companies started offering national catalogues in their native tongues. Ten months later, aggressive American companies like Yahoo! and Lycos launched "localized" operations in several European countries.

Soon everybody was discovering that the issue wasn't geographical (say, having a search engine specialized on Germany and another tailored to Austria), but cultural.

"It didn't make much sense to create a German directory without including Austria and Switzerland and all the other German-speaking content available on the Web," explained Holger Kayser, director of Dino, which has been the first such system in Germany.

"We also list pages from the Ukraine, the Baltic States and the other countries of the former Soviet Union," said Dmitry Altukhov, the creator of Russia on the Net, a Russian-speaking directory based in Moscow.

"Ours is a francophone service," confirmed Loic Dachary, director of Ecila.

And while being tagged "Germany," "UK & Ireland" and "France," the three Yahoo! European ventures are in fact language-based. The latter encompasses the French-speaking portions of Belgium and Switzerland for example, all while leaving out sites carrying the French national identifier ".fr" but whose content is in English.

Said Dachary: "Language and shared culture are the key factor to offer a complete and competitive service, thus attracting audiences." And advertising money, of course. Ecila is already turning up profits. Leveraging its strong brand identity, Yahoo! has enlisted 75 major advertisers.

Publishing strategies do not vary a great deal from one to the other. A lot of sites offer the combination of a reviewed and edited catalogues (ie: Yahoo!-like) with a crawler-generated database (Altavista-like). Almost all have teamed up with local publishers, pollster and press agencies to add news, weather reports, newsletters, event coverage (like the coming French election) and advanced search mechanisms (by city or region, as at Shinyseek, for example).

Yahoo! European services are modeled on the main California-based engine, yet a closer look reveals significant differences. "We've had some interesting internal cultural struggles regarding the way we organize and categorize information," Denis Jamet conceded. Yahoo! UK includes a special section on the Royal Family, for example, while the French puts gastronomy at the forefront. A future Italian site is likely to give the best spot to soccer.

"On the U.S. site, fashion is listed under leisure," Jamet said. "This was just not acceptable by French users, for whom fashion is a major industry and a cultural mark."

There is also the issue of "illicit" content: "French are less prudish than Americans when it comes to naked women," he added. But on the contrary, "because of French laws, we leave out racist or revisionist sites that would be acceptable to the U.S. site."

Even categorization of scientific knowledge is different: "Europeans are more 'serious' -- or better said: boring."

For all these efforts Yahoo! "is not yet into a truly pan-European approach," commented William Hill, managing director of Lonergan Digital Sarl in Paris and responsible for Yellowweb, one of the three "continent-wide" search engines. Yellowweb currently allows searches in seven languages and has just teamed up with competitor Euroseek to offer enhanced search options.

The Stockholm-based Euroseek is the most interesting new player in the intense competition between companies providing ways to find information online. The service started last fall with an interface in 27 languages. Nine million documents are currently listed in the database -- still a long way to go when compared with the world's largest, HotBot, which includes 55 million documents.

"Our system is built to be multilingual from the very start," said Froeberg, the company's president. After selecting the language you want, all further pages appear in that language. Euroseek technology allows searches to be limited to specific countries or languages -- and flashes advertising according to these choices.

With a staff of eight, Froeberg has spent several months designing the system, yet he couldn't get rid of all mistakes. The Italian home page opens with "Annunzie" instead of "Annunci" for example, while the French one lacks several accents. "We've recruited translators on Internet Relay Chat (IRC) channels, and the quality of the job is sometimes inadequate," Froeberg admitted.

This may change very soon. Euroseek is selling five million shares to investors in a private placement online -- a first in Europe -- to raise \$3 million, and plans a public offering on the Nasdaq Stock Market next fall. Banners on the Web site informing users about the offer have already been replaced twice, and the current deadline is May 31.

"This has been slower than we've expected, but considering that we're offering shares only on the Internet and that nobody has done that before in Europe, we're quite happy," Froeberg said. Euroseek has already raised about \$2 million.

The third European search engine is EuroFerret. Produced by Muscat Ltd, a software company in Cambridge, north of London, it does not display ads and is uniquely intended "as a pilot project for Muscat to learn about webcrawling," explained John Snyder, its marketing director. Still, EuroFerret handles six languages, has four million documents listed and several interesting features, like the "expand" option that suggests adequate words to refine the search.

The most popular search engine in Europe at the moment (according to IDC's survey), Altavista has tried to take up the challenge together with the Swedish state-owned telecommunications operator Telia. They have set up a European-based mirror of the Californian site that includes a feature that asks users to first pick the country they are from and the language they use -- it can be accessed in 23 different tongues. Yet the replica is far slower than the original in updating

Previously Reported Documents

1 - Gade, M. *User behavior and evaluation of multilingual information access in digital libraries*. Berlin School of Library and Information Science. Berlin: Germany. <http://www.ieee-tcdl.org/Bulletin/v7n1/papers/gaede.pdf>

Abstract:

While the importance of multilingual access to information systems is undoubted, few truly operational systems exist and can serve as examples. This dissertation addresses the issue of what the user expectations and the consequences for system development are in a multilingual information environment. It starts with a general overview over the aspects of multilingual access in digital libraries. Building on previous experiences, the study focuses on a combination of log file analysis and an usability test on user needs and desired features for multilingual access based on a functional digital library with multilingual requirements (Europeana). I present the Europeana Clickstream Logger, which logs and gathers extended information on user behavior, and show first examples of the data collection possibilities. The outcome of the analysis is a description of user requirements. The dissertation concludes with the development of a possible approach for the design of multilingual information systems.

2 - Peters, C., Sheridan, P. (2001). *Multilingual information access. Lecture Notes in Computer Science*. Volume 1980/2001, p. 51-80. DOI: 10.1007/3-540-45368-7_3.

Abstract:

The global information society has radically changed the way in which knowledge is acquired, disseminated and exchanged. Users of internationally distributed networks need to be able to find, retrieve and understand relevant information in whatever language and form it may have been stored. For this reason, much attention has been given over the past few years to the study and development of tools and technologies for multilingual information access (MLIA). This is a complex, multidisciplinary area in which methodologies and tools developed in the fields of information retrieval and natural language processing converge. Two main sectors are involved: multiple language recognition, manipulation and display; cross-language search and retrieval. The paper provides an overview of the main issues of interest in both these areas. Topics covered include: multilingual document indexing, specific requirements of particular languages and scripts, techniques for cross-language information retrieval (CLIR), resources, and system and component evaluation.

3 – Wade, V., Ghorab, R. M., Leveling, J., Zhou, D., Jones, G. F. (2010). *Identifying common user behavior in multilingual search logs. Multilingual Information Access Evaluation I. Text Retrieval Experiments, Vol 6241*. p. 518-525. [Abstract not available]

4 – Wu, D., Daqing, H., Luo, B. (2012). Multilingual needs and expectations in digital libraries: A survey of academic users with different languages. *The Electronic Library* 30(2). p.182 – 197. <http://www.emeraldinsight.com/journals.htm?issn=0264-0473&volume=30&issue=2&articleid=17020839&show=abstract>

Abstract:

Purpose – This study aims to survey academic users in order to identify their needs and expectations about multilingual information processing when they interact with digital libraries. The study specifically aims to determine the disparities in needs and expectations when users speak different languages.

Design/methodology/approach – A survey was designed to fill in the gaps in the knowledge about academic users' multilingual needs and expectations for digital libraries. The survey questionnaire incorporates questions about different aspects of the participants' multilingual needs and expectations covering multilingual needs, the multilingual behavior, often-used multilingual information resources, and desired functions for the multilingual services, retrieval and interfaces in digital libraries. The results are obtained through statistical analyses and clustering methods.

Findings – Overall, participants exhibited many multilingual needs during their academic activities. They often require multilingual information when they access academic databases or web information. Frequently, participants use online translation resources and tools, but they are not satisfied with the translation quality. Participants want many multilingual capabilities in digital libraries; they also want more sophisticated multilingual search interfaces. However, participants from different countries or who speak different languages show significant differences in their multilingual needs and expectations of digital libraries. This study's three user groups demonstrated clear differences in all aspects of multilinguality examined, as did the three latent groups identified through the clustering methods.

Originality/value – Few studies have examined the multilingual information process in digital libraries from the point of view of academic users. This study draws its inputs directly from real academic users from different countries and provides insights into multilinguality in digital libraries.

5 – Chen, J., Bao, Y. (2009). Cross-language search: The case of Google language tools. *First Monday*, 14(3). [no pages as it is an online-only journal]. <http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/2335/2116>

Abstract:

This paper presents a case study of Google Language Tools, especially its cross-language search service. Cross-language search integrates machine translation (MT) and cross-language information retrieval (CLIR) technologies and allows Web users to search and read pages written in languages different from their search terms. In addition to cross-language search, Google Language Tools provides various language support services to multilingual information access. Our study examines the functions of Google Language Tools and the performance of its cross-

language search. The results and analysis show that Google Language Tools are useful for Web users. Its cross-language search service provides quality query translation while the automatic translation of result pages needs further improvement. The paper suggests that cross-language search could be used by different types of Web users. The authors also discuss the strategies and important issues with regard to implementing multilingual information access services for information systems.

6 – Roseblat, G., Tse, T. (2006). User study of a Spanish-language clinicaltrials.gov prototype system. *AMIA Annual Symposium Proceedings Archive 2006*, p. 659-663.
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1839723/>

Abstract:

We conducted a user study of monolingual and bilingual Spanish-speaking consumers (n=36) to evaluate a Spanish-language ClinicalTrials.gov prototype. The prototype leverages an existing English-only consumer health resource by combining (1) Spanish-English cross-language information retrieval (CLIR) and (2) English-Spanish document display techniques. We collected user feedback on expectations, usability, and satisfaction. Preliminary results suggest improved online information access by Spanish-speakers. The goal is to develop a general approach for other systems and languages.

7 – Gonzalo, J., Peinado, V., Clough, P., Karlgren, J. (2009). Overview of iclef 2009: Exploring search behavior in a multilingual folksonomy environment.
http://clef.isti.cnr.it/2009/working_notes/iclef_overview_2009.pdf

Abstract:

This paper summarises activities from the iCLEF 2009 task. As in 2008, the task was organised based on users participating in an interactive cross-language image search experiment. Organizers provided a default multilingual search system (Flickling) which access images from Flickr, with the whole iCLEF experiment run as an online game. Interaction by users with the system was recorded in log files which were shared with participants for further analyses, and provide a future resource for studying various effects on user-orientated cross-language search. In total six groups participated in iCLEF with different approaches, ranging from pure log analysis to specific experiment designs using the Flickling interface.

8 – Ruiz, M. E., Chin, P. (2009). Users' image seeking behavior in a multilingual tag environment. *Cross-Language Evaluation Forum – CLEF*, p. 37-44. DOI: 10.1007/978-3-642-15751-6_5. <http://academic.research.microsoft.com/Paper/6802138.aspx>

Abstract:

This paper presents the results of a user study conducted in the framework of the Interactive Image Retrieval task at CLEF 2009. The main goal of our research is to understand the way in which users search for images that have been annotated with multilingual tags. The study is based on the application of grounded theory to try to understand the challenges that users face

when searching for images that have multilingual annotations, and how they cope with these challenges to find the information they need. The study includes two methods of data collection: an online survey and a face to face interview that included a search task using Flickling. Because this was our first year participating in the interactive image CLEF, we found that the most challenging aspect of conducting a user centered evaluation in the context of CLEF is the short amount of time that is available from the time the task is defined and the deadline for submitting results. User studies require the approval of the research protocol by the Institutional Review Board of University before we can start gathering any data and conducting user interviews. We were able to collect data for approximately three weeks (from 6/29/2009 to 7/17/2009) before the Flickling system was shutdown for server maintenance. During this time we collected 12 responses to the online questionnaire and 6 face to face interviews. Our results indicate that 67% of the users search for images at least once a week and that the most common purposes for finding images are entertainment and academic. Our results from the user interviews indicate that the users find the known-item retrieval task hard to do due to the difficulty in expressing the contents of the target image using tags that could have also been assigned by the creator of the image. The face to face interviews also give some feedback for improving the current Flickling interface, particularly the addition of a spell checker mechanism and the improvement of the multilingual translation of terms selected by users. Our results have limitations related to the number of users that participated in the study as well as the fact that the users were recruited from only one of the colleges at the University of North Texas. We would need to conduct these experiments in a larger and more diverse population in order to derive a more general conclusion.

9 – Petrelli, D., Beaulieu, M., Sanderson, M., Hansen, P. (2002). User requirement elicitation for cross-language information retrieval. *New Review of Information Behaviour Research*, 3(2), p. 17-35. <http://www.mendeley.com/research/user-requirement-elicitation-cross-language-information-retrieval/>

Abstract:

Who are the users of a cross-language retrieval system? Under what circumstances do they need to perform such multi-language searches? How will the task and the context of use affect successful interaction with the system? Answers to these questions were explored in a user study performed as part of the design stages of Clarity, a EU founded project on cross-language information retrieval. The findings resulted in a rethink of the planned user interface and a consequent expansion of the set of services offered. This paper reports on the methodology and techniques used for the elicitation of user requirements as well as how these were in turn transformed into new design solutions.

10 – Petrelli, D., Clough, P. (2012). Analysing user's queries for cross-language image retrieval from digital library collections. *The Electronic Library*, 30(2), p. 197-219. DOI: 10.1108/02640471211221331.

Abstract:

Purpose - This paper aims to describe a study of the queries generated from a user experiment for cross-language information retrieval (CLIR) from a historic image archive.

Design/methodology/approach - A controlled lab-based user study was carried out using a prototype Italian-English image retrieval system. Participants were asked to carry out searches for 16 images provided to them, a known-item search task. Italian speaking users generated 618 queries for a set of known-item search tasks. User's interactions with the system were recorded and queries were analysed manually quantitatively and qualitatively. The queries generated by user's interaction with the system were analysed and the results used to suggest recommendations for the future development of cross-language retrieval systems for digital image libraries.

Findings Results highlight the diversity in requests for similar visual content and the weaknesses of machine translation for query translation. Through the manual translation of queries the authors show the benefits of using high-quality translation resources. The results show the individual characteristics of users while performing known-item searches and the overlap obtained between query terms and structured image captions, highlighting the use of user's search terms for objects within the foreground of an image.

Research limitations/implications - This research looks in depth into one case of interaction and one image repository. Despite this limitation, the discussed results are likely to be valid across other languages and image repositories.

Practical implications - To develop effective systems requires studying user's search behaviours, particularly in digital image libraries.

Originality/value - The growing quantity of digital visual material in digital libraries offers the potential to apply techniques from CLIR to provide cross-language information access services. The value of this paper is in the provision of empirical evidence to support recommendations for effective cross-language image retrieval system design.

11 - WEB RESOURCE:

TrebleCLEF. (2012). Evaluation, best practices, and collaboration for multilingual information access. <http://www.trebleclef.eu/research.php>

Appendix A

Concept Outline

CONCEPTS	TERMS
Information Retrieval	Information retrieval Information-seeking Information-seeking behavior Search behavior Searching
Foreign Language	CLIR Cross-language Cross-lingual Foreign language Languages Linguistics MLIA Multilanguage Multilingual Multilingual information access Multilingualism
Users	Usage Use User behavior User experience User studies User study

Appendix B

Queries

Preliminary Queries: [NOTE - preliminary queries were not effective]

Dialog

- Query 1: **Databases: Library & Information Services**
(information? AND use?) AND (foreign(W)language OR cross-language OR cross(w)language OR cross-lingual OR cross(w)lingual OR multilingual)
- Query 2: **Databases: sf allhuman, allnews, allpaper, allscience, allsoc, allsochu**
(information(w)retriev? and use?) and (foreign(w)language or cross-language or cross(w)language or cross-lingual or cross(w)lingual or multilingual) and (system? or technolog? or technique?)
- Query 3: **Databases: sf allsochu, allscience**
information(w)retriev? and (usage OR use?) and (foreign(w)language OR cross-language OR cross(w)language OR cross-lingual OR cross(W)lingual OR multilingual) and (system? OR technolog? OR technique?)

Google

- Query 1: (“information retrieval” AND (use OR usage OR user)) AND (“foreign language” OR foreign OR multilingual OR cross-lingual OR “cross language” OR “cross lingual”) AND (system OR technology OR technological OR technique)

Google Scholar

- Query 1: (“information retrieval” AND (use OR usage OR user)) AND (“foreign language” OR foreign OR multilingual OR cross-lingual OR “cross language” OR “cross lingual”) AND (system OR technology OR technological OR technique)
- Query 2: (“information retrieval” OR information OR “use of information”) AND (use OR usage OR user) AND (“foreign language” OR foreign OR multilingual OR cross-lingual OR “cross language” OR “cross lingual”) AND (system OR technology OR technological OR technique)

Revision 1 Queries:

Google

- Query 1: “multilingual information access”
Query 2: ("multilingual information access" OR "MLIA") AND ("user studies" OR "user study") [relevant results]

UB Libraries

- Query 1: “user behavior and evaluation of multilingual information access in digital libraries” [Note: I was trying to find one of the articles below to find more information, but I got some other results with this]

Yahoo

- Query 1: ("user study" or "user studies") and "information retrieval" and (language or lingual or multilingual) [relevant results]

Infomine

- Query 1: |user stud*| and |information retrieval| and (language or lingu*) [no results]
Query 2: |user stud*| and MLIA [no results]
Query 3: |user stud*| and |multilingual information retrieval| [no results]
Query 4: |user stud*| and |information retrieval| [no results]

YouTube

- Query 1: ("user studies" or "user study") and MLIA
Query 2: ("user studies" or "user study") and (multilingual or language) and "information retrieval"
Query 3: MLIA user studies [no relevant results]

Web of Science

- Query 1: “user stud*” and “information retrieval” and multilingual [no relevant results]
Query 2: “user stud*” and “information access” and multilingual [no results]
Query 3: “user stud*” and “information access” and language [1 result, possibly relevant]

NY Times (searched through Google)

- Query 1: MLIA site:www.nytimes.com [no results]
Query 2: multilingual information retrieval site:www.nytimes.com [no relevant results]
Query 3: multilingual information access site:www.nytimes.com [no relevant results]
Query 4: digital multilingual information access site:www.nytimes.com [no relevant results]

Revision 2 Queries:

LexisNexis

Query 1: (“information retrieval” OR “information access”) AND (multilingual OR MLIA) AND (“user study” OR “user behavior” OR “search behavior”)

[attempted to access LexisNexis on four occasions - news search would not work properly]

NY Times (through Google)

Query 1: (“information retrieval” OR “information access”) AND (multilingual OR MLIA) AND (“user study” OR “user studies” OR “user behavior” OR “search behavior”) site:nytimes.com [no results]

Query 2: multilingual “information seeking” site:nytimes.com

Query 3: multilingual searching digital site:nytimes.com [no relevant results]

Query 4: multilingual online searching site:nytimes.com [1 relevant result]

Google Videos

Query 1 (“information retrieval” OR “information access”) AND (multilingual OR MLIA OR “multilingual information access”) AND (“user studies” OR “user study” OR “user behavior” OR “search behavior”) [no relevant results]

Query 2: (“information retrieval” OR “information access”) AND (multilingual OR MLIA OR “multilingual information access”) AND (“user studies” OR “user study” OR “user behavior” OR “search behavior”) -site:.biz [no relevant results]

Query 3: (“information retrieval” OR “information access”) AND (multilingual OR MLIA OR “multilingual information access”) AND (“user studies” OR “user study” OR “user behavior” OR “search behavior”) -site:.biz -site:7strategy.com [no relevant results]

YouTube

Query 1: (“information retrieval” OR “information access”) AND (multilingual OR MLIA OR “multilingual information access”) AND (“user studies” OR “user study” OR “user behavior” OR “search behavior”) [no relevant results]

Query 2: (multilingual OR MLIA OR “multilingual information access”) AND (“user studies” OR “user study” OR “user behavior” OR “search behavior” OR usage) [no relevant results]

Query 3: “digital information retrieval” and user and multilingual [no relevant results]

Google News

Query 1: (“information retrieval” OR “information access”) AND (multilingual OR MLIA OR “multilingual information access”) AND (“user studies” OR “user study” OR “user behavior” OR “search behavior”) [no results]

Query 2: (“information retrieval” OR “information access”) AND (“foreign language” OR foreign OR multilingual OR cross-lingual OR “cross language” OR “cross lingual”) AND (“user studies” OR “user study” OR “user behavior” OR “search behavior”) [no results]

Query 3: Information multilingual user study [no relevant results; new term: “user experience”]

Query 4: Multilanguage information retrieval “user experience” [“Multilanguage” not recognized by Google - search engine substituted “multilingual” instead; no results]

Science Magazine

Query 1: “information retriev*” and (“user stud*” or “user behavior” or “user experience” or “search behavior”) and (multilingual or MLIA or “multilingual information access”) [no results]

Query 2: “information retriev*” and user* and (multilingual or MLIA) [no results]

Query 3: “information retriev*” and multilingual [no relevant results]

Query 4: Multilingual and use* [no relevant results]

Query 5: use* and (multilingual or MLIA) and information [no relevant results]

[Realized that, even though the “help” section declared Boolean searching was possible, many irrelevant search results came back due to “or” and “and” being tagged]

Query 6: use* multilingual MLIA information [no results]

Query 7: multilingual information use* [no relevant results]

Revision 3 Queries:

LISTA

- Query 1: (“information retriev?” OR “information access”) AND (multilingual OR MLIA) AND (“user stud?” OR “user behavior” OR “search behavior” OR “user experience”) [no results]
- Query 2: “cross-language information retrieval” and (“user stud?” OR “user behavior” OR “search behavior” OR “user experience”) [1 relevant result - previously retrieved in Search Revision 1] [Got term “information-seeking behavior”]
- Query 3: (“cross-language information retrieval” or multilingualism) AND “information-seeking behavior” [1 relevant result]
- Query 4: “information-seeking behavior” and (MLIA or “multilingual information access”) [no results]
- Query 5: (“user stud?” OR “user behavior” OR “search behavior” OR “user experience” OR “information seeking”) AND multilingual [2 relevant results; 1 possibly relevant result]
- Query 6: (“use? stud?” OR “use? behavior” OR “search behavior” OR searching) AND (language? OR linguistics) [1 relevant result]
- Query 7: (“use? stud?” OR “use? behavior” OR “search behavior” OR searching) AND (multilanguage? OR multiling?) [no results]
- Query 8: (“use? stud?” OR “use? behavior” OR “search behavior” OR searching) AND “cross-language?” [no results]
- Query 9: cross-language search? [4 relevant results, 1 possibly relevant result; got term: CLIR]
- Query 10: CLIR AND use? [retrieved same documents as Q9 with 1 additional possibly relevant result]
- [Publication from 1976 to 2009, but nothing older than 1999 was retrieved.]

ACM Digital Library

- Query 1: (CLIR OR “cross-language” OR MLIA OR multilingual OR multilanguage) AND (use* OR behavior OR search) [no results]
- Query 2: CLIR AND use* [retrieved many of the same documents as Q9/Q10 in LISTA]
- Query 3: (multilingual OR multilanguage) AND use* [no relevant results]

Query 4: (CLIR OR MLIA) AND (“user stud*” OR “user behavior” OR “search behavior”)
[1 relevant result]

Query 5: “information-seeking” AND CLIR AND use* [2 relevant results]

Query 6: CLIR and “user study” [1 relevant result; 1 possibly relevant result]

DIALOG

Query 1: (information-seeking OR search(w)behavior OR searching) AND (user(w)stud?
OR user(w)behavior OR user(w)experience OR use?) AND (CLIR OR MLIA OR
cross-language OR multilingual OR multilanguage OR
multilingual(w)information(w)access) [no relevant results]

Search 1: Library & Information Services databases
Expand “MLIA”
E3 = MLIA [43 results]
s e3 and use? [29 results]
rd [28 results]
[1 relevant result]

Search 2: Library & Information Services databases
Expand “CLIR”
E3 = CLIR [653 results]
s e3 and use? [441 results]
rd [376 results]

[Discovered that CLIR = Council on Library and Information Resources]

s s4 not CS:council on library and information resources [8 results]
[1 relevant result]

Search 3: Library & Information Services databases
Expand “multilingualism”
E3 = multilingualism [4312 results]
E8 = multilinguality [138 results]
s e3 and e8 and information(w)retriev? and use? [1 result]
[no relevant results]

Search 4: Library & Information Services databases
Expand “multilanguage”
E3 = multilanguage [1264 results]
s e3 and information(w)retriev? and use? [38 results]
rd [36 results]
[1 relevant result; 2 possibly relevant results]

- Search 5: Library & Information Services databases
Expand “search(w)behavior” [no results]
- Search 6: Library & Information Services databases
Expand “information-seeking”
E3 = information-seeking [557 results]
E10 = information-seeking behavior [295 results]
s (e3 or e10) and multilingual? and information(w)retriev? [1 result]
[no relevant results]
- Search 7: E17 = information-seeking behaviour [70 results]
E36 = information-seeking habits [6 results]
E49 = information-seeking patterns [10 results]
s (e3 or e10 or e17 or e36 or e49) and (multilanguage OR multilingual? OR
MLIA OR CLIR OR cross-language OR cross(w)language) [3 results]
[1 relevant result - previously retrieved]
- Search 8: Library & Information Services databases
Expand “user(w)studies” [no results]
- Search 9: Library & Information Services databases
Expand “user(w)behavior” [no results]
- Search 10: Library & Information Services databases
Expand “searching”
E9 = searching behavior [119 results]
s e9 and (multilanguage OR multilingual? OR MLIA OR CLIR OR cross-
language OR cross(w)language) [2 results]
[no relevant results]
- s e9 and multi(w)language [no results]
s e9 and language [5 results]
[no relevant results]