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Multilingual Information Access: Practices and Perceptions of Bi/multilingual Academic Users

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A thesis submitted in partial fulfillment of the requirements for the Doctor of Philosophy degree in Library & Information Science
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MULTILINGUAL INFORMATION ACCESS: PRACTICES & PERCEPTIONS OF BI/MULTILINGUAL ACADEMIC USERS

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Abstract

The research reported in this dissertation explored linguistic determinants in online information searching, and examined to what extent bi/multilingual academic users utilize Multilingual Information Access (MLIA) tools and what impact these have on their information searching behavior.

The aim of the study was three-pronged: to provide tangible data that can support recommendations for the effective user-centered design of Multilingual Information Retrieval (MLIR) systems; to provide a user-centered evaluation of existing MLIA tools, and to offer the basis of a framework for Library & Information Science (LIS) professionals in teaching information literacy and library skills for bi/multilingual academic users.

In the first phase of the study, 250 bi/multilingual students participated in a web survey that investigated their language choices while searching for information on the internet and electronic databases. 31 of these participants took part in the second phase which involved a controlled lab-based user experiment and post experiment questionnaire that investigated their use of MLIA tools on Google and WorldCat and their opinions of these tools. In the third phase, 19 students participated in focus groups discussions and 6 librarians were interviewed to find out their perspectives on multilingual information literacy.

Results showed that though machine translation has alleviated some of the linguistic related challenges in online information searching, language barriers do still exist for some users especially at the query formulation stage. Captures from the experiment revealed great diversity in the way MLIA tools were utilized while the focus group discussions and interviews revealed a general lack of awareness by both librarians and students of the tools that could help enhance and promote multilingual information literacy.

The study highlights the roles of both IR system designers as well as LIS professionals in enhancing and promoting multilingual information access and literacy: User- centered design, user-modeling were found to be key aspects in the development of more effective multilingual information retrieval (MLIR) systems. The study also highlights the distinction between being *multilingually* information literate and being multilingual information literate. Suitable models for instruction for bi/multilingual academic users point towards Specialized Information Literacy Instruction (SILI) and Personalized Information Literacy Instruction (PILI).

Keywords: Multilingual Information Access (MLIA), Information searching behavior, Multilingual Information Retrieval (MLIR), Multilingual Information Literacy (MLIL), Information Literacy Instruction, experiment, web survey, focus group discussions, interviews, bi/multilingual students.

Co-authorship statement

While all the papers presented in Chapters 3, 4 and 5 will be co-authored with my thesis supervisory committee- Dr. Isola Ajiferuke, Dr. Liwen Vaughan and Dr. Pamela McKenzie, I attest that I was primarily responsible for the research presented in this dissertation, including the literature review, study design, data collection and analysis, and manuscript preparation. My committee is in agreement with this statement.

Acknowledgements

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List of Abbreviations

ACRL- Association of Colleges & Research Libraries

ALA- American Library Association

ALISE- Association for Library Science Education

ASIS&T- Association for Information Science & Technology

CLA- Canadian Library Association

CLIR- Cross Language Information Retrieval

IFLA- International Federation of Library Associations

IIR- Interactive Information Retrieval

IL-Information Literacy

IR- Information Retrieval

ISB- Information Searching Behavior

ISP- Information Search Process

LEP- Limited English Proficient

LWB- Librarians Without Borders

MLIA- Multilingual Information Access

MLIL- Multilingual Information Literacy

MLIR- Multilingual Information Retrieval

TAM- Technology Acceptance Model

PMLIR- Personalized Multilingual Information Retrieval

PILI- Personalized Information Literacy Instruction

SILI- Specialized Information Literacy Instruction

CHAPTER ONE

1.0 Introduction

1.1 Background

Multilingualism and multiculturalism form an integral part of the dynamics that define today's global information society. The European Commission, (2007) provides the definition of multilingualism as: "the ability of societies, institutions, groups or individuals to engage on a regular basis with more than one language in their day to day lives." (as cited in Cenoz, 2013, p.5). With regard to multilingualism in individuals, the definitions have become more inclusive and less rigid. These definitions tend to emphasize use as opposed to proficiency: Li (2008) for instance, defines a multilingual individual as "anyone who can communicate in more than one language, be it active (through speaking and writing) or passive (through listening and reading)" (p. 4). In this dissertation, both of these definitions are adapted, and the phenomenon of multilingualism is considered in the context of information access and specifically as it pertains to information retrieval and information searching in the online information environment. It is therefore used in reference to collections, information retrieval systems as well as library services to users.

With the exponential growth of information on the internet, information seeking and retrieval across national borders is constantly on the rise. The success of creating, accessing, using, disseminating and sharing international information resources largely depends on common tools and on an understanding of the concepts used. Natural Language Processing (NLP) applications and tools such as Cross Language Information Retrieval (CLIR), machine translation and multilingual thesauri are examples of some of the tools that are needed in

ensuring access to this information. Some studies have indeed emphasized that supporting Multi-Lingual Information Access (MLIA) and Cross-Language Information Retrieval (CLIR) in digital libraries and on the internet is crucial to providing universal access to digital content (Oard, 1997; Borgman, 1997; Bian & Chen, 2000; Peters & Sheridan, 2001). However, just as Evans (2006), points out, end users who are involved in multilingual information processing will often require greater functionality and support from IR systems than their monolingual counterparts: they require among other things, the translation or summarization of the information that they cannot fully understand or adequately manipulate, and also require help with formulating queries, perhaps in a language in which they may not be fully proficient.

User -centered research such as the current study can be useful in informing the creation of new MLIR (Multilingual Information Retrieval) systems or in refining existing MLIR systems. Investigations in this area could focus on different areas including observing how bi/multilingual users search for and use information written in languages they are not proficient in while also examining the role of language and culture in facilitating or inhibiting access to information.

1.2 Problem statement

The current multilingual environment on the web and in digital libraries has brought with it many opportunities, but as well many challenges. As Chowdhury (2003), observes:
"…multilingual information retrieval has now become a major challenge in providing access to the prolific information on the web" (p.72). In scholarly publishing, particularly in the sciences, the dominance of English is still undisputed: to borrow the words of Ammon (2001), the observation that English "is today's dominant language of science is stating what

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would be called a *Binsenweisheit* in German, a trivially obvious insight."(p.v). The assumption has been that with the exponential growth of information on the web and advancements in technology (e.g. increased and faster access to the internet, development of spanning languages such as XML(Extensible Markup Language), advances in Natural Language Processing etc.,) access and use of information has also been facilitated. However, this is not always the case, and the digital divide is still a reality for many in the world. For instance, even though all these technological advancements have been existent for some time, some studies have shown that some users are unaware of these advancements or they may lack the skills to fully utilize these technologies. These users therefore still need help in navigating this vast amount of information: for example, users may need help in formulating queries, determining the quality of the information they find on the internet, making relevance judgments and in interpreting the information found in a bibliographic record or in translating the content of the documents they retrieve. In particular, users who have to access content in a language they are not proficient in continue to face significant challenges. Rao and Varma (2009) correctly observe that from an interactive point of view, in monolingual information retrieval, the user can normally quickly adapt to the system's modus operandi; this is not the case however, when faced with an unknown target language; the need for search assistance in this instance becomes substantially higher.   This is the case for many users worldwide whose native languages do not have a significant presence on the web. Even though these statistics change rapidly, research has shown that a large part of the content on the web is in English while the majority of web users are non-native English Speakers. (Gey, et al, 2005; Berendt & Kralish, 2009). This is clearly shown in the following table:

Table 1.1

Top Ten Languages Used in the Web - December 31, 2013 (Number of Internet Users by Language)					
TOP TEN LANGUAGES IN THE INTERNET	**Internet Users by Language**	**Internet Penetration (% Population)**	**Users Growth in Internet (2000 - 2013)**	**Internet Users % of World Total (Participation)**	**World Population for this Language (2014 Estimate)**
English	800,625,314	58.4 %	468.8 %	28.6 %	1,370,977,116
Chinese	649,375,491	46.6 %	1,910.3 %	23.2 %	1,392,320,407
Spanish	222,406,379	50.6 %	1,123.3 %	7.9 %	439,320,916
Arabic	135,610,819	36.9 %	5,296.6 %	4.8 %	367,465,766
Portuguese	121,779,703	46.7 %	1,507.4 %	4.3 %	260,874,775
Japanese	109,626,672	86.2 %	132.9 %	3.9 %	127,103,388
Russian	87,476,747	61.4 %	2,721.8 %	3.1 %	142,470,272
German	81,139,942	85.7 %	194.9 %	2.9 %	94,652,582
French	78,891,813	20.9 %	557.5 %	2.8 %	377,424,669
Malay	75,459,025	26.6 %	1,216.9 %	2.7 %	284,105,671
TOP 10 LANGUAGES	2,362,391,905	48.5 %	696.1 %	84.3 %	4,856,715,562
Rest of the Languages	440,087,029	19.0 %	585.2 %	15.7 %	2,325,143,057
WORLD TOTAL	2,802,478,934	39.0 %	676.3 %	100.0 %	7,181,858,619

NOTES: (1) Top Ten Languages Internet Stats were updated for December 31 2013. (2) Internet Penetration is the ratio between the sum of Internet users speaking a language and the total population estimate that speaks that specific language. (3) Internet usage information courtesy of Nielsen Online, International Telecommunications Union, GfK, and other reliable sources. (4) World population information comes mainly from the U.S. Census Bureau .

Source: Internet World Stats

Many digital libraries are also acknowledging the importance of providing multilingual capabilities in order to serve a wider range of users, globally. For instance, the European Commission launched the i2010 Digital Libraries Initiative to enable access to multilingual information in European national libraries (Gey et al., 2006). However, it is worth noting that there are still very few digital libraries that offer multilingual information access: A study by Chen and Bao (2009) analyzed about 150 US digital libraries through literature on digital libraries and found that only 5 of them could be accessed by using more than one language. The five digital libraries were: Meeting of Frontiers- a bilingual multimedia English Russian digital library; France in America- a bilingual multi-format English- French digital library; Parallel Histories- a bilingual

multi-format Spanish- English digital library; The Perseus Digital library at Tufts University that offers access in English, Latin and Greek and the International Children's Digital Library (ICDL). Their investigation further revealed that these libraries do not support a cross language search. Some have debated the utility of Cross Language Information Retrieval (CLIR) by referring to it as ''the problem of finding documents that you cannot read''. To this argument, Oard, He and Wang (2008) countered aptly with the following response:

> "The debate need not turn solely on whether you can read what you find. Rather, the question to be answered is whether you can afford not to even know what exists in other languages. Perhaps that question could have been answered affirmatively in the past, but it seems unlikely that the 21st century will be as tolerant of such myopia." (p.209).

In light of these challenges, user centered studies such as this one are needed in order to provide empirical evidence to support recommendations for the effective design of MLIR systems such as search engines, digital libraries or online public access catalogs. By investigating the information seeking behavior of potential users of MLIA tools, the current study attempts to find answers to questions such as- what are the linguistic related needs of bi/multilingual users while searching for information online? What kind of language choices do they make in an increasingly multilingual online environment and what kind of support functionalities do they need/ desire to help them improve their search experience/ search success? The rich data from these studies could be used in informing Human Computer Interaction (HCI) researchers as well as IR system designers on where best to concentrate their efforts and investments. User- centered studies such as

the study documented in chapter 5 of this dissertation also offer the basis of a framework for LIS (Library & Information Science) professionals to teach academic users in a way that reflects actual behaviors and real- world situations.

Researcher's Approach

This dissertation is written from an advocacy/ participatory world view in that it aims at raising awareness about the language barriers that some- especially limited English proficient users may encounter in the online information environment. To that end, it aims at advocating for more MLIA tools to be included on IR systems and for these to be seamlessly integrated so they're easy to use. It also aims at lending a voice to some underserved student populations such as international students and raise awareness of some of the linguistic related challenges they may face while searching for information online. In line with the current emphasis on user-centered design/ participatory design / user-centered evaluation, the study also advocates for these in the context of IR system design and in the design and implementation of library services for this user group.

1.3   Scope of study

The aim of this study is to gain insight into the unique needs of potential or current MLIR system users and their information searching behavior, thus providing valuable information for MLIR system designers and Library & Information Science (LIS) professionals, while also presenting an opportunity to evaluate the MLIR functionalities on some of the existing Information Retrieval systems such as search engines, digital libraries or online public access catalogs and electronic databases. The study focuses on bi/multilingual academic users at a Canadian university setting, where English is the

primary language of instruction and where the majority of the students are native English speakers.

1.3.1 Information searching and retrieval in the Canadian context

Canada, as a bilingual country with two official languages was uniquely suitable for this study. One main reason for this is the existence of bilingual corpora that make MLIR and machine translation easier and more efficient. The results of the study could therefore be very pertinent in the Canadian context and could be implemented for search options used on library websites for academic institutions as well on government websites and other international agencies that provide information on their websites in more than one language. A large Canadian academic institution such as the University of Western Ontario was also suitable for this study as bi/multilingual participants could be recruited amongst the international student population, bilingual Canadians, as well as from regional student organizations and language related clubs.

1.4 Research design

The study was carried out in three phases, and used a mixed methods approach. The instruments used in the study were: a web survey, an operational experiment, a post experiment questionnaire, focus group discussions and interviews. The mixed methods approach was deemed appropriate for the study in that it allowed the researcher to collect data about the information searching behavior of bi/multilingual academic users in order to understand it from different perspectives. It was also deemed appropriate owing to the complexity and diversity of the topics being researched in the study, i.e. information searching behavior and language. The three phases led to three separate, but closely related studies. The studies were exploratory and aimed at contextualizing the

information searching actions and interactions in the multilingual information retrieval environment from the user perspective. Specifically, the studies sought to describe the user experience and identify the factors that influence the users' searching behavior in multilingual environments where Multilingual Information Access (MLIA) tools are available. The research also sought to concretize the concept of MLIL (Multilingual Information Literacy) and identify the role that different stakeholders such as IR system designers and LIS professionals could play in enhancing and promoting multilingual information literacy.

1.4.1 Research questions

The current study sought to investigate the following questions in the case of bi/multilingual online information academic users in Canada.

1) What role do linguistic determinants (e.g. English language proficiency, search language choice, use of MLIA tools such as machine translation) play in information seeking on the web and on select electronic databases?

    a) Do bi-/multilingual speakers use other languages (apart from English) while searching for information on the web and in electronic databases?

    b) What are their language choices and considerations in their query formulation?

2) How much are bilingual/multilingual system users aware of, and in the habit of using multilingual information access tools available in electronic databases and search engines?

3) How does the availability *and use* of multilingual information access tools affect the information searching behavior of bi/multilingual academic users?

4) How well do current MLIR (Multilingual Information Retrieval) systems (e.g. search engines and electronic databases) meet the expectations and needs of bi/ multilingual academic users?

5) What are the perspectives of current academic librarians, and students regarding how to address the linguistic related challenges that bi/multilingual users face while searching for information online?

These research questions were addressed in the study as summarized below:

Table 1.2: Relationship between research questions & instruments

Research Questions	Instrument
1) What role do linguistic determinants play in information seeking on the web and on select electronic databases?	Web survey
2) How much are bilingual/multilingual system users aware of, and in the habit of using multilingual information access tools available in electronic databases and search engines?	Web survey
3) How does the availability *and use* of multilingual information access tools affect the information searching behavior of bi/multilingual academic users?	Experiment
4) How well do current MLIR (Multilingual Information Retrieval) systems (e.g. search engines and electronic databases) meet the expectations and needs of bi/ multilingual academic users?	Experiment
5) What are the perspectives of current academic librarians, and students regarding how to address the linguistic related challenges that bi/multilingual users face while searching for information online?	Focus group discussions (students) Interviews (Librarians)

1.5   Significance of study

In seeking to gain a deeper understanding of the information seeking behavior of bi\multilingual academic users, the research presented in this dissertation contributes to three areas of research: 1) Design/ development of Multilingual Information Retrieval systems. 2) Theories/models of information seeking behavior and 3) Web usability and information services for bi/multilingual users. Moreover, in keeping with the current emphasis on user-centered design, the current study provides data that could inform system designers on how to cater to users with diverse linguistic backgrounds and language proficiencies. It also provides valuable information to LIS (Library and Information Science) professionals on how to design services-e.g. information literacy classes for this specific user- group- i.e. bi/multilinguals. Web designers for multinational companies and governments could also find the results of the study useful in providing information to support their localization and internationalization efforts.

Since the study used real users or potential users of MLIA tools, the study also highlighted practical application domains where MLIR technologies can be employed, thus helping motivate the need for further developments in MLIR while also providing an opportunity to evaluate the effectiveness of already existing technologies. Another practical implication of the study points towards adapting a user-centered model for providing services for this user group e.g. models or curricula for teaching information literacy and library skills.

1.6 Limitations

The study used a purposive sample limited to non-native English speakers who are bi/multilingual and currently matriculated at the University of Western Ontario (including its affiliated colleges) and Fanshawe College. The participants were mainly drawn from the international student and ESL student populations at these institutions because of the assumption that they have knowledge of English and at least one additional language. Proxy measures were used in determining the English language proficiency level of the participants; the measures used were: attendance in ESL classes within the last two years, number of years with English as language of instruction, and self- reported proficiency levels. Potential response bias could also be present especially on the web survey and post experiment questionnaire where self-reported data was used.

A within- subjects experiment design was used in the second phase of the study and it is acknowledged here that some potentially intervening variables that could affect users search experience and ultimately their satisfaction with the results they retrieve were not controlled for. These included: language proficiency levels, search expertise, domain knowledge, carry-over effects and availability of foreign language documents in the databases used in the experiment. It was also difficult to control for the differences in system performance due to the different language pairs used by the participants. This is of particular relevance in this study as other research has shown that translation greatly impacts the retrieval performance of a MLIR system.

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CHAPTER TWO

2.0 Literature Review

2.1 Information searching behavior

In its broadest sense, information behavior addresses all aspects of human information interactions with various forms of information. It has been variously defined as the study of how people need, seek, give and use information in different contexts, including the workplace and everyday living (Pettigrew et al, 2001). This definition is consistent with Wilson who defines information behavior as: "The totality of human behavior in relation to sources and channels of information, including both active and passive information seeking and information use." (Wilson, 2000, p. 49). In cognitive approaches such as those posited by Ingwersen and Jarvelin (2005), the individual or the user is the main driving force behind information behavior. A cognitive approach bears implications for a study such as this one since differences in individuals including languages used/ and level of proficiency in these languages, culture, information literacy, domain knowledge are all factors that affect the users search experience while using an Information Retrieval system.

Information searching behavior is a subset of information seeking and refers to people's interaction with information retrieval systems, ranging from adopting a search strategy to judging the relevance of information retrieved (Wilson, 2000). Researchers generally agree that studies on information searching behavior may not always be generalizable; it is often acknowledged that users have diverse backgrounds and therefore will exhibit

different information seeking behaviors due to differences in culture, *language* and even learning styles. As Case, 2007 points out:

> "Information seeking behavior often defies generalization and usually escapes observation; it is difficult to generalize about a behavior that varies so much across people, situations and objects of interest and so much of it takes place inside a person's head." (p. 15)

Nevertheless, human information searching behavior and navigation behavior patterns have been studied from various points of view. A literature review reveals a range of approaches that have been used in classifying search behavior and its determinants with the most common being categorizing information searching behavior depending on the users' visit objective (e.g. goal oriented vs. exploratory search mode.) (Hoffmann and Novak 1996, Moe 2003, Dholakia & Bagozzi 2001, Nielsen 1997). Nielsen further divides these categories by search typology i.e. link dominant, search-dominant or mixed behavior users. Other studies have looked at various personal and situational variables and how they impact search behavior. For instance, Schneiderman (1997) and Petrelli et al (2004) considered the type of search task and how it affects search behavior while Scaife and Rogers (1996) looked at information presentation. It would seem however that there's consensus that the most important variable affecting search behavior is the user's cognitive ability. This has been so far examined mainly under the aspects of domain knowledge and web/ search experience (e.g. Navarro- Prieto, 1999; Vakkari, 2000). Ingwersen also explored information searching behavior from a cognitive view by focusing on user characteristics and the user's context (Ingwersen, 1995, 2005).

To date, there exists a dearth of studies that have examined a user's language or linguistic background as a determining variable. Luna et. al (2002, 2003) explored the effects of language processing and cultural issues, their interaction and their impact on website evaluation. Their study found that certain factors such as design elements, content and the users' cultural values may moderate a language's effect on attitudinal variables such as persuasion. Berendt and Kralisch, (2004) explored the impact of users' linguistic backgrounds on their information searching behavior. Using a log file analysis of a website in the field of public health care on which the information was offered in four different languages, they focused on the users' preferences in regard to use of search engines and alphabetically content –organized hyperlinks. Their study found that search experience and domain knowledge act as mediating factors in the case of users searching for information in their non-native language. For this group of users, search engines and alphabetically organized hyperlinks were their preferred methods for searching for information while content organized links were the preferred methods for users searching in their native language. They further found that users who did not have sufficient proficiency in the non-native languages were excluded completely from accessing the website (i.e. did not attempt to access the website) as their foreign language proficiency level was below a threshold that would allow them to visit the website with minimal or a reasonable amount of linguistic effort. With the use of an operational experiment in one of the phases, the study documented in this dissertation seeks to update, build on and enhance these earlier studies that explored linguistic determinants in information searching.

2.2 Interactive Information Retrieval

Interactive information retrieval (IIR) is an Information Retrieval (IR) model that accounts for the cognitive, interactive and situational aspects of IR. The concept underlying interaction has to do with the intersection of a person with an information system. This notion of interaction grew from an awareness that simply matching the user's query with retrieved results fails to recognize the intersection of the human with the system which could account for important *variability* in explaining the results obtained. Consequently, many researchers have asserted that the users' query formulation and the users' interaction with the system becomes a defining characteristic of the information search process (Belkin et al., 1980). Ingwersen's cognitive model of IR interaction (1996) is the most developed example of such a model. This model goes beyond automatic query modification to incorporate interactive processes. IIR has therefore emerged as a particularly useful paradigm for seeking information, mainly because of its emphasis on the searcher. In interactive information retrieval models, the searcher is in control; they exercise this control in two ways: by indicating what they are looking for (issuing queries), and by examining what is found (judging relevance, and selecting documents), iterating between these two processes as they deem necessary. One of the major differences between traditional Information Retrieval (IR) and Interactive Information Retrieval is in their view of feedback. In the traditional IR model, feedback is understood as an automatic IR system function called automatic Relevance Feedback. In this case, a user's query is automatically reformulated by the IR system. Conversely, in the Interactive IR model, feedback is evolving from system feedback (the output of an IR system transmitted to the user to a more interactive view of feedback as a cognitive and

situational user process (Spink, 1997). Such a view of feedback becomes even more critical in MLIR environments where it is sometimes necessary for the user to modify translations.

Since context and searchers' characteristics (e.g. language proficiency) form an integral part of the search process in a multilingual information retrieval environment, Interactive Information Retrieval models were useful in informing the current study. Just like the user and their interactions with an information retrieval system is the focus of interactive IR, a user- oriented view has also been adopted in cross language research within interactive Cross language Information Retrieval (CLIR). For purposes of this study, the definition of interactive CLIR given by Oard et al, (2008) was adopted, as it gives emphasis on the user and their interaction with the system. They define interactive CLIR as: "A process in which *searcher* and system *collaborate* to find documents that satisfy an information need regardless of the language in which those documents are written" (p.181).

2.3 Multilingual Information Access (MLIA)

2.3.1 Multilingual Information Access (MLIA): Definition of concepts

Multilingual information access and retrieval is a specific area of the academic domain of information access and retrieval whose main focus is the development of systems for finding and using information in multiple languages, both monolingually and across languages. The broader term Multilingual Information Access (MLIA) refers to accessing, querying and retrieving information from collections in any language at any level of specificity while Multilingual Information Retrieval (MLIR) a narrower term, refers in general to the processing of information in multiple languages (maybe queries,

documents or both). The retrieval of information in a MLIR system may be monolingual or across languages. Examples of multilingual information access tools include multilingual Interfaces for electronic databases and library websites, multilingual library guides, correct display of multiple fonts or characters, machine translation of retrieved documents, Cross Language Information Retrieval (CLIR) search options and Multilingual Information Retrieval (MLIR). The focus of this study lies at the intersection on information seeking and information retrieval, with Cross Language Information Retrieval being one of the tools that are explored extensively. CLIR is a subfield or branch of Information Retrieval that is devoted to overcoming language boundaries. It refers specifically to systems that are used to query a multilingual collection in one language and retrieve documents in other languages or in another language. Peters, Braschler and Clough (2012) give specific support functionalities that could benefit users who lack proficiency in the language they are searching in, and summarize them as follows:

Query formulation support – Query translation (e.g., language selection, select/deselect translated terms, back translation of query terms)

Evaluation support (document selection and examination) - Provide summary of results (e.g., present results written in different languages, generate and translate document surrogates)

Query reformulation support -Edit query translation (e.g., query expansion and translation refinement)

Browsing support (collection and results) - Multilingual controlled vocabularies and classification Schemes, machine translation. (p.24).

In addition to the above, providing a multilingual interface to support these search functions is important. Savourel (2001) also suggests that a key area to consider for a multilingual user interface is Internationalization and Localization and provides definitions of these: "Internationalization is the process of developing a product in such a way that it works with data in different languages and can be adapted to various target markets without engineering changes, i.e., developing an architecture that is able to accommodate multiple languages; while Localization is the subsequent process of translating and adapting a product to a given market's cultural conventions." (p.35). Localization could thus involve customization of numeric, date and time formats, currency usage, keyboard usage, symbols, icons and colors, legal requirements, rules for sorting and re-designing any references to culturally-specific ideas.

2.3.2 Applications of Cross Language Information Retrieval (CLIR)

Cross Language Information Retrieval (CLIR) has found many applications in information retrieval, these include:

- *Recall-oriented retrieval*: For instance, when searching for patent information, one would want to find *all* information regarding the invention in question regardless of what language it's written in.

-*Multimedia Information retrieval:* Images, as a form of visual media, can be regarded as "language-independent" and therefore lend themselves easily for adopting CLIR in practice. Thus, when looking for an image or non-text information, the user may only need a translation of the annotation accompanying the image in order to retrieve it, but what's relevant to the user is not so much the caption but the image itself.

-Digital libraries: Many libraries are providing digital access to their collections which may include information in multiple languages. Multilingual information access tools such as CLIR could be helpful in providing access to this information.

-Common markets (European Union, NAFTA, MercoSul): Information sharing and all other transactions could benefit from CLIR. The EU for instance, has shown a great interest in CLIR, funding several projects on the subject; the most important was perhaps EMIR (EMIR-Consortium 1994). EMIR was one of the first general CLIR systems to be implemented and evaluated.

-Multilingual countries: In countries that have more than one official language (e.g. Canada, Switzerland), official information is published in all languages, providing a very good source of corpora (e.g. Canadian parliament debates in French and English; Swiss newspapers in German, French and Italian). These corpora can be used effectively in statistical machine translation, and in turn be used to improve Cross language information retrieval.

-Multinational companies: Many large organizations and companies provide multilingual information on their websites but do not provide a cross language search- one has to search in one language at a time. In recognition of this need, some companies have invested in CLIR research: these include: Xerox (Renders 2003), IBM (Franz, 2002), Microsoft (Gao, 2000), and Google (Chen & Bao, 2009).

- For multilingual/ bilingual users: These users, who are the focus of the current study, may prefer to save time by issuing a single query to a multilingual collection, and retrieving documents in more than one language.

-Internet use: Research has shown that while English is still the most dominant language on the web (accounting for at least 56.37% in 2005); the majority of the users are non-native English speakers (Gey, et al, 2005; Berendt & Kralish, 2009). For non-native English speakers or web users with limited English proficiency, CLIR could indubitably prove very useful for Everyday Life Information Seeking (ELIS) (Salvolainen, 1999).

Examples of end users who could potentially benefit from such efforts include:

- Health information: doctors, patients, and caregivers searching for medical or treatment information from other countries or in other languages;

- Tourism: vacationers or travelers looking for travel guides or local information while traveling abroad;

- Business information: investors interested in doing business in other countries or expanding their markets abroad;

- Immigration: new immigrants who have not yet developed proficiency in the languages spoken in their host countries.

-Education: Foreign language/translation students looking for comparative texts or online multilingual dictionaries; or international students studying in a foreign country.

User- centric studies such as this one could also help CLIR system designers and developers of digital-library software (e.g. Greenstone) in determining where best to concentrate their efforts and investments so as to build systems that are efficacious and user-friendly.

Increasing collaboration between different countries and governments necessitates more effective and efficient ways of retrieving and sharing information on global issues such as trade, environment, terrorism and human rights. Research on language barriers and their

impact on information access could prove invaluable in providing recommendations for improving information sharing efforts.

2.3.3 User- centered studies in CLIR

Until recently, CLIR research has focused on laboratory experiments entailing physical system development, for example, development of translation techniques for query translation or content (document) translation using various methods: ontology, machine translation lexicons, bilingual dictionary and corpora (Oard, 1997). In order to bridge the gap between CLIR research and applications, an effort has to be made to understand who the real users or potential users of CLIR systems are. As Petrelli et al (2004) point out: "Little effort has been made to identify the users of CLIR systems and to fully understand how these users can make use of such systems." (p.23). Based on a systematic review of literature on multilingual digital libraries, Diekema,(2012) also reported similar findings, i.e. that research in multilingual digital libraries was mostly system based involving experimental systems or system prototypes and very few studies explored the users or potential users of multilingual digital libraries. However, a number of user- centered studies in Multilingual Information Retrieval are documented in literature: For instance, Rieh and Rieh (2005) explored the behavior, perceptions and preferences of Korean bilingual academic web users at the Myongji University in Korea. Their study found that participants seldom used CLIR options or used multilingual tools available on the web; instead, they simply chose their search language depending on the type of search task rather than familiarity or knowledge of the language. They found that the participants preferred to use English for their research, but chose Korean for their personal information need such as hobbies, sports and news. This finding is consistent with that of

Petrelli et al (2006) who found that users of CLIR systems chose the most appropriate language for their task, not necessarily their native language. In their case study observing and interviewing real users, Petrelli et al (2004) found that search behavior of subjects was influenced by the user goals and purposes for the search, language knowledge and also the cognitive demands that the CLIR task placed on the user. The study further found that users wanted to: search multiple languages simultaneously, change query languages within the same search session, and filter results by language, genre, date or other features. (p.928). Their study also revealed that users had varied views in regard to how they wished to interact with the system: users with good searching skills (e.g. LIS professionals) preferred to have more control over the system: such a system would have a transparent user interface which can show the user how the system translates the query terms and allow for a back and forth search and feedback process that lets the user modify, update and correct the systems translation before a final search is performed. They also found that LIS professionals were more skeptical of machine translation and simply considered it not "good enough" (p.929). Petrelli et al suggested that that this may be because as search intermediaries, LIS professionals felt they had to offer high quality service and a machine translation might somehow reflect poorly on their search effectiveness. In a study that surveyed academic users of multilingual digital libraries, Wu, He and Luo (2012) reported similar results: they found that even though the participants reported using online translation resources and tools, they also reported that they were often dissatisfied with the translation quality of these tools. Moreover, in this study, the participants indicated a desire for more multilingual capabilities in digital libraries and also expressed a desire for more sophisticated multilingual search interfaces.

Other studies that have focused on international students in North American universities who are non-native English speakers have found that language barriers and cultural differences often inhibit individuals' access to and use of libraries and online information (Curry & Copeman, 2005; Zhuo, 2007; Ferrer-Vinent, 2010). Liestman and Wu (1990) also made a strong case for translated materials as an efficient and successful tool for library orientation and instruction: their study reports the results of library orientation sessions for international students that were offered to one group in English and to another control group in their native language, Chinese. Pre and post test results indicated only a modest increase in the scores for the group receiving library instruction in English while the group receiving library instruction in Chinese increased their post test scores significantly. In a study that surveyed international students at the University of Western Ontario in Ontario, Canada, Nzomo, Rubin and Ajiferuke (2012) found that English language proficiency was positively correlated with satisfaction of results from an online search. They also found a lack of awareness of multilingual information access tools among this user group.

2.3.4 CLIR system user profiles

Several user-centered studies in CLIR have explored how the level of proficiency in a language affects the use of a CLIR system: Roehling (2007) mentions three types of users for whom a CLIR search is useful: for people who have a large passive vocabulary but a smaller active vocabulary (seldom used vocabulary) could benefit from CLIR in that even though they are able to read the documents they retrieve, they may not have the vocabulary to formulate a query that's precise enough to retrieve the documents. A CLIR

system would allow them to enter their query in the language they're most comfortable with and retrieve the results for them. Secondly, multilingual speakers may want to issue one query to search a multilingual collection and retrieve relevant documents in all the languages that are supported by the system. In the third scenario, monolinguals who have translation resources available but want to save some costs may want to look at a machine translated summary of a document to see if it's relevant and worth translating. Indeed, summaries of documents retrieved through a CLIR system would benefit even polyglots; as Hansen et al, (2002) observe: "assessing the worth of documents in a foreign language is more complex than in one's first language". In a study exploring which users would benefit from CLIR in web retrieval, Airio (2007) reported similar findings , i.e. that users with good to moderate/ passive target language skills would benefit from query translation while those with poor target language skills could benefit from both query and document translation.

In their user participation experiments using the *Clarity Project*, Petrelli et al, (2004), recruited journalists, analysts, translators and search intermediaries (LIS professionals). Their study found that users could also be classified according to the task at hand (search only vs. search and use). Journalists and translators for instance used CLIR systems for search and use while search intermediaries would sometimes use the systems for search only in order to retrieve documents that could be used by their client. They pointed out that the task or purpose (search only or search and use) does bear implications on the language knowledge of the user: users who utilized CLIR systems for search and use often need to at least have good to moderate target language skills in order to use the documents they retrieve while search intermediaries could still retrieve relevant

documents even without high proficiency levels in the target language. However, in their use of CLIR systems, search intermediaries often have to compensate for poor language skills by their searching expertise and a deep knowledge of the text collections they're searching. Amongst all the studies, there is consensus that users who lack proficiency in the language they are searching in could most certainly benefit from CLIR systems. As Gey et al, (2005) point out, users of CLIR systems are mostly looking for and retrieving information in languages in which they have little or no competence. The systems should therefore have capability of providing help in query formulation, in interpreting the results (including judging relevance), and in reading the documents they select (translation of documents). It is from such findings that several CLIR /MLIR researchers have recognized the importance of user – system interaction and advocated for user-centered designing and as well for building initial models based on real user participation (Petrelli et al., 2008 & López-ostenero et al. 2008).

2.3.5 User participation in evaluation of MLIR systems

Evaluation is a key activity for IR research and for any research. As Gey et al. (2005), point out: "There is a duality between research and evaluation. Good research is validated by evaluation and good evaluation environments stimulate further research" (p.417). The evaluation of information retrieval (IR) systems can be defined as the process of assessing how well a system meets the information needs of its users: in general, there are two broad categories of evaluation, system evaluation and user-based evaluation. User-based evaluation measures the user's satisfaction with the system, while system evaluation focuses on how well the system can rank documents research. Since the overall goal would be to determine how well a retrieval system meets the information

needs of users, user-based evaluation would seem to be the ideal measurement of a system. However user-based evaluation is extremely expensive and difficult to carry out. Some reasons for this include:

- It requires a large, representative sample of actual users of the retrieval system

- Each of the systems to be compared must be equally well developed and complete with an appropriate user interface; and each subject must be equally well trained on all systems; and

- Factors such as the learning effect must be controlled for. (Jones & Willet, 1997, p.168).

Previous IR evaluation has mainly focused on system-oriented evaluation, predominately through the use of standardized benchmarks or test collections in controlled laboratory experiments. In system- oriented evaluation, such as the *Cranfield* model, the objective was to keep all variables controlled and to obtain results, which would enable one to state conclusions about retrieval systems in general (Robertson, 1981). The limitations with this model lie with its restricted assumptions on the cognitive and behavioral features of the environment in which IIR systems function (Ellis, 1996). Thus, in recent years, IR laboratory researchers have increasingly shown an interest in research design tools and methodologies that address user-IR system interaction from a more contextual perspective. For instance, Ingwersen and Jarvelin, (2005) propose an integrated and contextual perspective on IR experimentation and evaluation, founded upon a cognitive approach to IR. Robertson and Hanconk- Beaulieu, (1992) also put forth a user- centered approach to evaluation, based upon what they summarize as the three revolutions: the cognitive revolution, the relevance revolution and the interactive revolution. The

cognitive and relevance revolution necessitate that realism be assured with reference to the formation of information need and relevance assessment processes while the interactive revolution regards the fact that IR systems have become more interactive. Thus, in contrast to the system- oriented approach, the cognitive–user centered approach offers a broader definition to the system, viewing seeking and retrieval processes as a whole. The main purpose of this type of evaluation is to determine how well the user, the retrieval mechanism and the database interact in extracting information, under real-life operational conditions. Robertson and Hancock-Beaulieu, (1992) summarize the difference between these two major approaches by stating:" The conflict between laboratory and operational experiments is essentially a conflict between, on the one hand, control over experimental variables, observability, and repeatability, and on the other hand, *realism'* (p.460).

Research in Interactive IR has also brought to the forefront the limitations of system-oriented evaluations, pointing out that since IR systems are mainly used in an interactive way, user-centered evaluations would be more helpful as they could be used to assess the overall success of a retrieval system *as determined by the end users*. The evaluation of IIR systems should therefore take into account the dynamic nature of information needs and relevance and reflect the interactive information seeking and retrieval processes. In essence, the user and their interactions with an information retrieval system is the focus of interactive IR. Borlund, (2003) proposes a framework for the evaluation of interactive IR systems and information searching behavior through an experimental setting which aims at measuring all the user's activities of interaction with retrieval and feedback mechanisms as well as the retrieval output. In evaluating multilingual IR systems, these

considerations are paramount especially as users in this case are often trying to retrieve relevant documents in languages with which they are not well acquainted.

Despite the costly nature of user-based evaluations, there have been system evaluation studies where the system was evaluated by real users: Chung et al. (2004) evaluated a portal CLIR system by studying real users. The portal system named "CBizPort: Chinese Business Intelligence Portal" is a meta-search engine for business information of China, Taiwan, and Hong Kong and they asked users to compare this system with other search engines from these three regions. They started to investigate problems in existing search engines which might not serve many non-English speaking Internet users. From the beginning of the experiment and the evaluation, they tried to focus on real users' needs and difficulties. Their findings from the study's participants' comments indicated that CBizPort performed better than regional Chinese search engines in terms of analysis functions, cross-regional searching capabilities, and user-friendliness, while regional Chinese search engines had more efficient and were more popular. (p. 818).

More recently, Petrelli et al, (2008) conducted a series of interactive CLIR experiments through the *Clarity project*. These experiments proved invaluable in that they provided the opportunity to test usability parameters such as efficiency, effectiveness and user satisfaction; As Petrelli et al point out- "the effectiveness of a CLIR system should not only be determined by its ability to retrieve relevant documents but also on how it supports the whole task of retrieving and use."(p. 25). The experiments also suggested that there may be some exceptions to some long-held theories: for instance, current studies in Human Computer Interaction seem to support the idea that the user always needs to "supervise" the system i.e. receive feedback from the system and have full

control over the system. However, their experiments found that full control of the system was not "indispensable" and that most users only cared about the mechanisms of the systems when things went wrong or when they got a result they had not anticipated. The user-centered evaluations brought to the forefront the discrepancies that often exist between real life evaluations (using real users) and laboratory experiments; and they concluded that though difficult to conduct; "in the field evaluations" involving real users performing real tasks could help in arriving at a definitive understanding of CLIR users and their needs.

2.4 Theoretical Framework

The current research was informed by several models of information searching behavior, with specific emphasis on user-centered approaches. This approach to information seeking is concerned with the behavioral and cognitive aspects of information seekers. In this approach, human information seeking has been described as a behavior that includes questions, dialogue, and social and cognitive situations, associated with a user's interaction with an information retrieval system (Kuhlthau , Spink & Cool, 1992; Kuhlthau, 1993). Kuhlthau's model, referred to as the Information Search Process (ISP) is interesting because it addresses affective aspects of the search process. She posits that: "A model representing the user's sense-making process of information seeking ought to incorporate three realms of activity: physical, actual actions taken; affective, feelings experienced; and cognitive, thoughts concerning both process and content." (Kuhlthau, 1991, p.362). Her model is comprised of 6 stages: Initiation, Selection, Exploration, Formulation, Collection and Presentation. She attaches to these stages the associated feelings, thoughts and actions, and the appropriate information tasks. As an example, the

Initiation phase of the process is said to be characterized by feelings of uncertainty, vague and general thoughts about the problem area, and is associated with seeking background information: the 'appropriate task' at this point is simply to 'recognize' a need for information. The remaining appropriate tasks are: Identify, that is, fix the general topic of the search; Investigate, or search for information on that general topic; Formulate, focus on a more specific area within the topic; Collection, that is, gather relevant information on the focus; and Complete, end the information search. She posits that the feelings of uncertainty associated with the need to search for information often give rise to feelings of doubt, confusion and frustration. However, as the search process continues and is increasingly successful, those feelings change: as relevant material is collected the user's confidence increases and this is often associated with feelings of relief, satisfaction and a sense of direction. Kuhlthau also identifies four criteria that might affect information seekers' search processes to choose information: task, time, interest, and availability of the information (1993a, p. 39). These are critical factors used to judge relevance when information seekers conduct their information search. Kuhlthau empirically tested her model through a series of longitudinal studies of high school students, and later showed the applicability of the model to the work of a securities analyst. While I recognize that there might be differences in the users she used for her studies and the user group in this research, Kuhlthau's research certainly holds relevance for the current study in that it lays emphasis on the user and brings to the fore the need to assess user's perceptions of the availability of information, while also addressing the users' feelings during the different stages. In a multilingual search, especially when users are trying to access information in a language they're not proficient in- feelings of anxiety, uncertainty, frustration and

dissatisfaction are not uncommon. Kulthau's research was particularly relevant to the phase involving the focus group discussions with participants, as they narrated the kinds of emotions they have while searching for information in a language in which they may not be proficient.

This research also drew moderately on Bates' (1989) Berry picking technique theory for online information-seeking. Bates (1989) search model was created to reflect the real behavior of information searchers. While the traditional IR model simply matches the query with documents, Bates' model differs from it in four areas: (1) Nature of the query, (2) Nature of the overall search process,(3) Range of search techniques used, and (4) Information "domain" or territory where the search is conducted. Bates' model aligns well with the idea of interactive IR and the feedback process between the searcher and the system: As she explains, the formation of a query in real life may start from one topic, but new ideas may be generated during the search process. Moreover, users may obtain more useful ideas during the search process, multiplying the number of retrieval tasks involved in this search process. Bates (1989) wrote that "the query is satisfied not by a single final retrieved set, but by a series of selections of individual references and bits of information at each stage of the ever-modifying search. A bit-at-a-time retrieval of this sort is here called berrypicking."(p. 410). This idea of the "evolving search" seems to lend itself aptly to the multilingual information searching environment as users may want to modify translations, even language choices as their search progresses. Recommendations based on her model have been used to improve search techniques and interface design and would in no doubt be applicable to this study. In sum, Bates' theory offered important insights especially into the online searching environment that have informed and continue to

inform IR system designers; most of these recognize and advocate paying attention to users' information behavior and designing systems accordingly.

The dissertation was also informed by ideas espoused in Saracevic's stratified model of an IR interaction (Saracevic (1996, 1997). This model proposes that there is a sequence of processes (interactions) occurring in several connected levels or strata between user and system through an interface as a surface. "The levels or strata represent each different element, such as query (characteristics), cognitive (knowledge, structure…), affective (intent…) and situational (tasks...) on the user side; and, engineering (hardware, capacities), processing (software, algorithms…), and content (information resources, representations…) on the system side. " Saracevic (1996) further posits that as the information is processed, it continues to be modified by variables such as feedback from the system and the user, and therefore functions at various levels or strata as does the system and this interaction then leads to even more interaction. There is an emphasis on the complexity of the IR interaction, with the user and the system often needing to adapt. The current study considered part of this model in assessing how queries are modified as the search progresses. Additionally, the model informed the analysis in regard to the roles of the user vs the role of the system: the strata on the user side such as language of proficiency and type of task were considered while on the system side the study considered what type of MLIA tools are needed and at what stages in the information retrieval process. Furthermore, in a multilingual search where users often rely on machine translation it was worth exploring how the interactive feedback between user and system impacted the search outcomes.

Ingwersen and Järvelin's (2005) model of cognitive information retrieval was certainly applicable to the current study and was used as one of the theoretical frameworks to undergird the research. In their work, they highlight the disconnection between system-oriented information retrieval and cognitive and user-oriented information retrieval, and propose an integrated information seeking and research framework. In their framework, interaction and perception are the central processes of information seeking behavior and interactive information retrieval. They discuss the complexity of information retrieval processes by bringing information seekers' situations, work and search task, task complexity, knowledge types, cognitive styles and interactions into their framework. In the cognitive approach, both the information searching and information retrieval processes are regarded as processes of cognition. This is mainly because adopting a cognitive view helps to model and interpret other conceptions that are central to information searching and retrieval such as the concepts of work tasks, evaluation, relevance, and information acquisition and use. In this study, these are all concepts that are explored as they relate to the user's characteristics and their context. For instance, the researcher explored the context defining bi/multilingual users' information searching behavior. Specific aspects that were investigated include: how they make language choices and what challenges they consequently face as a result of these choices: e.g. how they formulate their queries, how they make relevance judgments especially when using a language they may not be very proficient in, their understanding of bibliographic information, and how they select and ultimately use information that is not in their native language. In summary, the main idea of Ingwersen and Järvelin's framework - "how *evidence* of a searcher's information behavior may be applied to guide or adjust

algorithmic information processing in system components through IR interaction" (p. 275) certainly aligns well with one of the objectives of this study- which is to provide empirical evidence to support recommendations for the effective *user-centered* design of MLIR systems.

The Information Foraging Theory as posited by Pirolli and Card (1995, 1999) was also considered in seeking to explain the information searching behavior of bi/multilingual users. This theory provides a theoretical foundation of the link between cognitive burden (i.e. effort) and behavioral reactions (Pirolli & Card, 1995, 1999). Their model aims to explain user strategies for seeking, gathering and consuming information on the Web based on the effort involved. Thus, the human information forager uses what Pirolli and Card call "the proximal perception of information scent" to assess profitability of an information source in relation to other potential sources (Pirolli & Card, 1999). In regard to the online information seeking environment, the theory posits that users continue to follow links as long as the information gained from following the link is not exceeded by the costs of accessing it, where costs are determined by time and cognitive effort. Many websites that appear to have multilingual interfaces at the outset sometimes end up being monolingual as one follows the links. Berendt and Kralisch, (2005) investigated how data distribution across languages on the web affects how web users access information and applied the concept of linguistically determined foraging to the use of search options and link-following behavior. Their study found that language-based cognitive burden was a determinant of web-site access and consequently, it does influence information seeking. In the current study, link-following behavior was analyzed in the context of search strategies used in a MLIR environment. However, since most participants chose to use

the keyword strategy, it could not be ascertained how language impacts link following

behavior. The tasks also turned out to be easy enough such that the captures could not

allow for aspects such as failed searches, or abandoned searches to be analyzed.

Longitudinal studies, log analyses or studies that do not utilize assigned tasks might yield

better and more data to aid in analyzing this aspect.

Explanatory models of information searching behavior were also relevant to this study.

Even though the study did not test either one of these models, the Technology

Acceptance Model (TAM) and Personalized Multilingual Information Retrieval (PMLIR)

informed the researcher's process in analyzing the data from the second phase of the

study which involved a user-experiment. This was mainly to find out their suitability in

representing the information searching behavior of bi/multilingual users. The TAM

model was considered in trying to find out users' acceptance of MLIA tools while the

PMLIR was considered in light of the diversity that was apparent in the users'

characteristics and in the way they used MLIA tools. The Technology Acceptance Model

(TAM) (Davis, 1989) posits that intention to use an information system is predicted by its

perceived ease of use and perceived usefulness. In the overall evaluation of the MLIA

tools, perceived ease of use and perceived usefulness were factors that were considered in

the current study, mainly in the users' responses on the post experiment questionnaire.

PMLIR models such as those proposed by Ghorab, Zhou, Steichen and Wade (2011)

would be of particular interest in this study as they take into consideration personal

characteristics of the user and especially those that pertain to language. In the case of the

current study characteristics such as language proficiency, domain knowledge, interests

would be taken into consideration. Furthermore, in light of the diversity of the user

group in this study, such a model could be suitable in representing their information searching behavior.

 In order to understand how bi/multilinguals process language, and the role of linguistic determinants in information searching the current study also drew upon various approaches /models in language and cognition. For instance, the researcher explored the Revised-Hierarchy Model by Dufour and Kroll (1995) which is a representation of language mechanisms in bilinguals, and investigates the cognitive costs of processing in L1 (language most often used by user, could be native language- user's level of proficiency is high) and L2 (language less frequently used by user; user's level of proficiency is low-moderate). Often used in cross-linguistic market research, the model attempts to explain the higher cognitive burden for non-native speakers trying to communicate or use their non-native language by showing the mechanisms of how second languages are acquired and stored. The model also shows that higher cognitive costs remain, even after the individual has become fluent in both languages. Hence, costs of L2 information processing are higher than those of L1 information processing. By the same token, L2 information processing at a lower proficiency level will often require more cognitive effort than L2 information processing at a higher proficiency level. The current study was also informed by research in psycholinguistics that documents both advantages and disadvantages of bilingualism. On the positive side, not only does bilingualism offer social and economic advantages, but empirical research has shown that lifelong bilingualism may strengthen general-purpose executive control systems, even for nonlinguistic perceptual tasks (Gold et. al, 2013, Costa et al., 2008; Bialystok & Craik, 2010). On the negative side, studies of vocabulary knowledge have consistently reported

lower scores for bilinguals in each language than for monolingual speakers of that

language, and this deficit appears at all ages across the life span (Bialystok, 2008). These

studies show for instance, that children learning two languages from birth generally have

a smaller vocabulary in each language than do monolingual children learning only a

single language. They also show that adult bilinguals typically take longer to retrieve

individual words than monolinguals do, and they generate fewer words when asked to

satisfy a constraint such as category membership or initial letter (Bialystok et al, 2009).

As vocabulary and lexical retrieval play an integral role in information retrieval, this

study attempted to explore the implications of these advantages and disadvantages that

bilinguals have in the context of an online information searching task.

2.5 Summary

User studies such as the current study hold potential for integrating research in

information seeking and information retrieval. The dichotomies that exist between these

two have often been evident, and the tension has sometimes been alarming to some. For

instance, Saracevic, 1999 warned against the danger of 'losing the field' and its possible

division into two isolated areas – an information science researching technological

systems, which is practiced mainly by computer professionals, and an information

science that focuses on the information user. Ingwersen and Järvelin (2005) bemoan the

fact that though closely interconnected, Interactive Information Retrieval (IIR), systemic

IR and information seeking have for the most part followed their own research agendas.

They speculate that this division may arise from how they view each other's results: on

the one hand, IR research sees information seeking results as short of practical utility and

"unusable academic exercise", on the other hand, information seeking sees IR research

as lacking in understanding and abstraction or "too narrowly bound with technology" (Ingwersen & Järvelin, 2005, p.2). To overcome this separation, they advocate a holistic perspective and propose a cognitive framework of nested contexts of information retrieval, information seeking and work/interest. They list a set of dimensions e.g. natural work/search task, user characteristics, and discuss how both IR research and information seeking studies should enlarge their perspective to include those aspects of the context. More recently, Jansen and Rieh, (2010) found that even though there seems to be tension between the fields of information searching and information retrieval due to contradictory constructs, a close examination especially of the pragmatic issues seems to point towards convergence. They point out that even though information searching is human centered while information retrieval is technology centered, they both focus on the interaction between people and content in information systems. Moreover, with this trend towards convergence, Jansen and Rieh (2010) posit that there's potential for collaboration between the two subfields and that such collaboration will contribute to enhanced user experience when seeking information and increased research activity. Saracevic, (1999) goes even further in his emphasis on user aspects by stating that "real progress in information science and by extension in Information Retrieval will come when we put the 'human' in the process of building a system."(p.1062). It would seem that LIS researchers are increasingly heeding these calls of collaboration between IR and Information searching and are focusing on the user. Prebor, (2007) in his study surveying research trends in the years 2002–6 at various information science departments worldwide identified a clear trend in masters' theses and doctoral dissertations towards social aspects of information moving into the spotlight. He concluded from this trend,

that it appears the user and their ability to sift through the vast sea of information is increasingly the primary research focus in the twenty-first century. The results from user –centered studies such as the current study seem to hold the potential for integrating or bridging perspectives between Information Retrieval (IR) research and information seeking. Other studies have emphasized the importance of user studies -understanding users, their typical information needs and how they interact with IR systems. As Robins, (2000) points out: "Most information retrieval (IR) systems are used by people and we cannot design effective IR systems without some knowledge of how users interact with them" (Robins, 2000, p. 57).

The research discussed in this dissertation investigates how bi/multilingual users interact with IR systems and especially how they cope with the linguistic related challenges they face while searching for information in a language in which they may not be fully proficient. The dissertation proceeds as follows: Chapter 3 discusses the first phase of the study, a web survey that investigated bi/multilingual academic users' information searching habits in the online environment; Chapter 4 discusses the second phase of the study, a lab- based user-experiment that involved bi/multilingual users' using MLIA tools on Google and WorldCat; Chapter 5 discusses the third phase of the study that involved focus group discussions with bi/multilingual students and interviews with librarians, and lastly, Chapter 6 provides an overview of the research while summarizing the findings from the three studies. This chapter also discusses the contributions of the study and provides recommendations for future research.

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CHAPTER THREE

Multilingual Information Retrieval & Use:
Perceptions and Practices amongst Bi/multilingual Academic users

3.1 Introduction

User Experience (UX) and User perception are closely related and are sometimes used interchangeably. User Experience is undoubtedly the broader term and seems to encompass user perception. While the definition of both these aspects tends to be elusive, a review of the Library and Information Science (LIS) literature seems to suggest that definitions of user experience tend to emphasize products and systems (Nielsen group, 2010; Majors, 2012; Gallant & Wright, 2014; Yue & Beisler, 2014) while user perception definitions mainly address services (Lupien, 2007, Ouellete, 2011; Rehman, 2011, Rojeski, 2012;). In the current study, data pertaining to the user experience is captured mainly in the second phase of the study where the students are observed using MLIA tools on two MLIR systems while data regarding their perceptions is collected mainly through a web survey in the first phase of the study, a post experiment questionnaire during the second phase and through focus group discussions and interviews carried out in the third phase.

With the exponential increase of information on the internet, multilingual information retrieval and use is on the rise. While the broader term Multilingual Information Access (MLIA) refers to accessing, querying and retrieving information from collections in any language at any level of specificity, Multilingual Information Retrieval (MLIR), a narrower term, refers in general to the processing of information in multiple languages (maybe queries, documents or both), (Peters, Braschler & Clough, 2012). The retrieval of

information in a MLIR system may be monolingual or across languages. Therefore, ideally in a MLIR context, a user would be able to search for relevant information using search criteria in one language and retrieve all the documents which match those criteria in a unified list, regardless of the language of the documents or its indexing (Chen & Gey, 2004; Jorna & Davies, 2001). This is sometimes referred to as Cross- Language Information Retrieval (CLIR). Multilingual Information Access in the electronic environment is facilitated through various language tools including: multilingual Interfaces for electronic databases, OPACS and library websites, multilingual library guides, correct display of multiple fonts or characters, machine translation of retrieved documents, multilingual thesauri, Cross Language Information Retrieval (CLIR) search options and Multilingual Information searching. The current study explores the information searching behavior of bilingual and multilingual academic users and examines their language choices and their use or non-use of the multilingual information access tools mentioned above. Peters, Braschler and Clough (2012) suggest that making these kinds of functionalities available on MLIR systems could benefit users who lack proficiency in the language in which they are searching. It could also greatly enhance their experience, lending support in Query formulation, in evaluating the results they retrieve, in query reformulation and in browsing support.

In keeping with the current emphasis on the human aspects of information retrieval such as interaction, emotions of the users, user satisfaction and perception, this study aims to enhance and contribute to user-centered studies that have been previously done in this area by examining and exploring the information searching behavior of bi/ multilingual academic users at two Canadian Higher Education institutions namely the University of

Western Ontario (and its affiliate colleges- Brescia University College, Kings University College and Huron University College) and Fanshawe college.

3.2 Related work

User- centered studies in Multilingual Information Retrieval are documented in literature: Rieh and Rieh, (2005) explored the behavior, perceptions and preferences of Korean bilingual academic web users at the Myongji University in Korea. Their study found that participants seldom used Cross Language Information Retrieval (CLIR) options or used multilingual tools available on the web; instead, they simply chose their search language depending on the type of search task rather than familiarity or knowledge of the language. They found that the participants preferred to use English for their research, but chose Korean for their personal information need such as hobbies, sports and news. This finding is consistent with that of Petrelli et al (2006) who found that users of CLIR systems chose the most appropriate language for their task, not necessarily their native language. In their case study observing and interviewing real users, Petrelli et al (2004) found that the search behavior of subjects was influenced by the user goals and purposes for the search, language knowledge and also the cognitive demands that the CLIR task placed on the user. The study further found that users wanted to: search multiple languages simultaneously, change query languages within the same search session, and filter results by language, genre, date or other features. (p.928). Their study also revealed that users had varied views in regard to how they wished to interact with the system: users with good searching skills (e.g. LIS professionals) preferred to have more control over the system: such a system would have a transparent user interface which can show the user how the system translates the query terms and allow for a back and forth search

and feedback process that lets the user modify, update and correct the systems translation before a final search is performed. They also found that LIS professionals were more skeptical of machine translation and simply considered it not "good enough" (p.929). Petrelli et al suggested that that this may be because as search intermediaries, LIS professionals felt they had to offer high quality service and a machine translation might somehow reflect poorly on their search effectiveness. In a study that surveyed academic users of multilingual digital libraries, Wu, He and Luo (2012) reported similar results: they found that even though the participants reported using online translation resources and tools, they also reported that they were often dissatisfied with the translation quality of these tools.   Moreover, they also found that participants generally indicated a desire for more multilingual capabilities in digital libraries and also expressed a desire for more sophisticated multilingual search interfaces.

3.2.1 Bi/Multilingual academic users: International students

Statistics have shown that enrollment of International students in North American universities and colleges has been constantly on the rise over the last 5 years. According to a 2013 *Open Doors Report on International Educational Exchange*, the number of international students at colleges and universities in the United States increased by seven percent to a record high of 819,644 students in the 2012/13 academic year (Institute of International Education, 2013). Canadian institutions also showed an increase in international student enrollment: According to data from the Canadian Bureau of International Education (CBIE/BCEI), Canada ranks as the world's 7th most popular destination for international students. It also showed that International student enrollment

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grew from 136,000 in 2001 to over 265,000 in 2012 – a 94% increase. At the University

of Western Ontario, there were 1257 international undergraduate students and 1067

international graduate students matriculated for the 2012-2013 academic year. In

response to this trend, many academic libraries are beginning to pay close attention to

how they can better serve this population.

Several studies have explored the information seeking behavior of international students

and their use of libraries; some of these have focused on their perceptions of the

reference services offered in the library. For example, a field stimulation research study

by Curry and Copeman (2005) explored the international students' interactions at the

reference desk and their perception of the quality of the reference service they received.

Though the researchers acknowledged that their study would have limited replicability,

its findings of the anxiety experienced by international students in their use of libraries

was consistent with the results of other prior studies. Onwegbuzie and Jiao (1997),   in

their comparative study of library usage patterns and anxiety levels of 552 native and

non-native English speaking university students found that non- native English speaking

students showed higher levels of anxiety due to barriers associated with the library staff

interaction along with other affective barriers. Other studies, however, like that of Song

(2005) compared information seeking behaviors of domestic and international business

students and found no significant difference between these two student populations.

Some studies have shown that given the choice, international students could benefit from

multilingual services or at the least an acknowledgement of their language needs. Ferrer-

vinent (2010), in his study on international students' language preferences at the

reference desk found that students initially preferred using English for their reference

transactions but most often preferred or would have liked follow-up help in their primary language. Ziming Liu (1993) interviewed 54 foreign students at the University of California, Berkeley and found that international students had problems in using the library because of their limited proficiency in English. Another study by Liu and Redfern (1997) also found that international students with English as their primary language were more likely to be successful in using the library than those for whom English was not their native language. Some studies have also shown that English language proficiency affects international students' use of electronic information: The results of a study by Irving (1994) indicated that a lack of fluency in English may result in failed online catalog searching. Zhuo, Emanuel, and Jiao (2007) in their study on International students and their language preferences while using library databases found that many were not aware of the specialized language features on some of the electronic databases. Based on the results of this study, they recommended bilingual library instruction and multilingual library tutorials. This recommendation is consistent with the findings of other studies that showed that orientation and library instruction in a student's native language can improve library research skills (Liestman & Wu, 1990; Spanfelner, 1991; Molteni & Bosch, 2009) or at the least, that specialized library instruction and orientation could greatly benefit them (Jackson, 2005).

In her annotated bibliography on international students and academic libraries, Peters (2010) notes that several factors, such as technological developments, social networking, and the increasing expansion of information infrastructures, have changed how international students interact with libraries and librarians. The current study took into consideration that many of the previous studies on international students have focused on

in person library use and where language issues have been addressed, the focus has mainly been on communication (verbal and non-verbal) and thus often putting the onus on the international student to improve their communication style. Therefore, in recognition of the current trend in accessing digital information and e-learning, the current study focuses on electronic information while exploring the potential usefulness of MLIA (Multi-lingual Information Access) tools in alleviating language barriers. Specifically, it investigated the information seeking behavior of bilingual and multilingual academic users on the internet and in electronic databases. The scope of the study therefore goes beyond international students to include students who may be by immigration status domestic students but are bilingual or multilingual. Since the focus of the study is on language barriers in the online information seeking context, an effort was made to recruit students who have Limited English Proficiency (LEP): some previous studies have shown that many International students' English proficiency is good to very good (Sarkodie-Mensah, 2000; Nzomo, Rubin & Ajiferuke, 2012) and/or some may already have English as their first language or their primary language (Conteh-Morgan, 2003).

Nzivo and Chuanfu (2013) present a different but relevant perspective of international students in China. The study, done at Wuhan University in China, aimed at finding out their perceptions of library services and information resources. Even though the students lacked proficiency in Chinese the study showed that the students could easily do their searches online in English and did not face many language related difficulties in using the libraries. Instead, the onus was on the Chinese librarians to learn English in order to better serve the students. A similar study done at Tsinghua University in Beijing also

offers suggestions that would also put more responsibility on the librarians and not the

international students: the suggestions were varied and involved creating a bilingual

library information environment for international students that included providing an

English version website, purchasing more English resources, an integrated library system

that has bilingual interface options for the OPAC, as well as information literacy classes

that are offered in English (Aihong, 2009).

3.2.2 Bi/Multilingual academic users: ESL students

Similar to the case of international students, some studies have shown that ESL students,

due to their limited English proficiency, experience anxiety when using the library and so

avoid using the library altogether. (Jiao & Onwuebguzie, 2001; Martin, 2012). Koehler

and Swanson (1988), show that ESL students, even those from within the United States,

have difficulty conducting library research, and that language, cultural, and social barriers

experienced by international students result in an "overall lack of library skills" (p.149).

Bilal (1989) suggests that the difficulties encountered in teaching international students

how to use the library may partly be due to the students' English language proficiency.

The current study focused mainly on language barriers in the online environment: a

survey of the literature revealed similar studies that document the difficulties that ESL

students encounter while using library databases and OPACS. Garcha and Russell (1993)

surveyed a group of non-matriculated ESL students and show that international students

lack confidence in their ability to search journal article databases. DiMartino, Ferns, and

Swacker (1998) looked at the database searching techniques used by ESL students and

compared it to that of native speakers and found that the main difficulties of ESL students

that differed significantly from those of native English speakers were concentrated in

vocabulary issues—utilization of plural forms, and the use of synonyms and expanded

concepts for more robust searching. Corroborating these findings, Walker (2012)

acknowledges that even undergraduate students who are native English speakers often

find research databases difficult to use; however, choosing appropriate keywords and

using controlled vocabulary are skills that must be learned, and these skills become even

more difficult to develop for ESL students. She further cautions that Librarians should

not assume that a student with excellent spoken English is necessarily able to identify

keywords and potential synonyms when creating a search statement. In her extensive

research on language learning and library learning, Bordonaro (2006, 2013, 2014)

explores how international students improve their vocabulary and other language skills

during library database searching, thus establishing a positive connection between library

database searching and language learning.

In view of the consensus that the language barrier is one of the most significant

challenges facing students who have limited English proficiency in their use of libraries,

some studies have suggested a collaboration between librarians and ESL instructors.

Martin et al (2012) suggest that librarians build relationships with ESL instructors and

also embed themselves in ELS programs in order to relieve the anxiety that ESL students

often have in using libraries. Conteh-Morgan (2001) made a similar observation and

suggests that information literacy skills should be incorporated in the ESL curriculum and

ESL instructors encouraged to teach these skills as well. She posits that ESL class

sessions tend to provide a low-anxiety environment compared to Information Literacy

sessions where domestic students and international students are all present and the special

language needs of international students/ ESL students are often not put into

consideration. Conteh- Morgan (2002) further makes the case that librarians should try to understand and incorporate second-language learning theories, such as innatist and interactionist. She further presents a model for including such theories in library instruction and suggests collaboration between librarians and ESL instructors.

In her article on teaching ESL students, Ormondroyd, (1989) documents barriers in communication experienced between language-minority students and librarians and shows the importance of staff training in regard to cultural sensitivity and effective communication while providing instruction to ESL students. Similarly in regard to communication, Walker (2012) suggests that librarians should make a conscious effort at using slower-paced, clearer speech, avoiding library jargon. However, in some cases, it may be difficult to circumvent library jargon- some of these terms just have to be learned as part of the vocabulary. For instance terms like catalog, plagiarism, database, stacks, call number are important to learn even for native speakers of English and it's necessary for the librarian to pause and clearly define these as part of the information literacy class; or the reference interview process if the opportunity is presented.

It is widely believed that due to technological advancements in machine translation, language barriers are becoming less severe. The current study provides a timely investigation on whether bilingual and multilingual students are taking full advantage of these technological advancements and/ or what further steps need to be taken to reduce language barriers in online information seeking, not just for academic users, but for all online information users worldwide.

3.3 Research Questions

The following research questions formed the basis for the current study:

1) What role do linguistic determinants play in information searching on the web and in electronic databases?

       a) Do bi-/multilingual speakers use other languages (apart from English) while searching for information on the web and in electronic databases?

       b) How much are bilingual/multilingual system users aware of, and in the habit of using multilingual information access tools available in electronic databases and search engines?

2) What linguistic related challenges do LEP (Limited English Proficient) users face while searching for information online and what kind of coping mechanisms do they employ?

3) What kind of library services do these students desire?

Table 3.1 Research questions and corresponding survey questions:

Research Question	Survey Question
1a) Do bi-/multilingual speakers use other languages (apart from English) while searching for information on the web and in electronic databases?	Do you ever use any languages other than English for searching the internet and/or electronic databases?
	4. a. What language do you use while searching for information on the internet?(check all that apply).
	9. In what language do you formulate your search terms (keywords)?
1b) How much are bilingual/multilingual system users aware of, and in the habit of using multilingual information access tools available in electronic databases and search engines?	14) Which of the following language tools do you use while searching for information online?(on the internet or on electronic databases)
2) What linguistic related challenges do LEP (Limited English Proficient) users	In the process of searching for information (both on the internet and on electronic

face while searching for information online and what kind of coping mechanisms do they employ?	databases) do you need linguistic help in any of the following areas when dealing with a foreign language? Please check all that apply.
	If you get your results in English, do you try to find a translation for the webpage?
3) What kind of library services do these students desire?	15. Which of the following services do you think would be most helpful to you in searching for information from your library databases?

3.4 Methodology

A web-based anonymous survey (see Appendix A) was administered through Survey

Monkey and was posted between March 1, 2014 and August 30, 2014. A purposive

sampling method was used to recruit participants: specifically, students who were likely

to speak or have knowledge of one other language in addition to English were targeted

for participation in the study. Moreover, amongst this group of students, those whose

native language is NOT English, especially those who are currently enrolled in ESL

classes were targeted. The author therefore acknowledges that this may have led to a

skewed sample as the survey was in English and the language used in the survey may

have been inaccessible to some Limited English Proficient (LEP) students. An

invitational e-mail to participate in the study was sent through a mass e-mail system to

both undergraduate and graduate international students who were matriculated at the

University of Western Ontario and the Affiliate colleges for the winter 2014 term. Out of

the 1120 e-mail invitational messages that were sent out, a total of 203 (N= 203)

responses were collected resulting in a response rate of 18.1%. Additionally, in a bid to

recruit bilingual/ multilingual students whose native language is not English but who are

not by immigration status considered international students, invitation e-mails were sent

out to regional student groups such as the Chinese Student Association, the African

student Association, Arab Students' Association etc. and to language and culture related

clubs such as the French Club, SALSA (Spanish and Latin Students' Association and the

Portuguese Connexion. The researcher also worked with instructors to recruit some

students from the English Language Institute at the University of Western Ontario and

ESL Program at Fanshawe College. Interested participants clicked the URL embedded in

the email and were directed to the survey website to join the study. These additional

efforts yielded another 47 responses bringing the total number of respondents for the

survey to 250 (n= 250). The survey questionnaire consisted of 3 sections. The first

section of the questionnaire was designed to collect demographic information about the

participants. This section included questions about gender, age, major, native language

and level in college (i.e. Undergraduate or Graduate). The second and third sections were

designed to elicit information from the participants about their use of language tools

while searching for information on the Internet and in electronic databases respectively.

Two general questions were included at the end: one was to give participants a chance to

comment on what type of linguistic help they often needed while searching for

information online, while the other sought the participants' input on what type of library

services they thought would be beneficial to them while searching for information online.

The web survey was also used to recruit participants who were interested in continuing in

the study and participating in the Experiment phase and/ or the Focus Group discussion

groups. Participants who were interested had an opportunity to click on a link and contact

the researcher.

3.5 Results

The collected data was analyzed using IBM SPSS statistics software version 22 and the results and findings are presented below:

3.5.1 Web survey section 1: Demographics

From the 250 (n=250) participants who completed the survey, 158 (63%) self-identified as undergraduate students compared to 91(37%) who identified themselves as graduate students. In regard to gender 100(41%) self- identified as male while 146 (59%) self-identified as female. Most of the respondents 184 (75%) fell in the 18-25 age category. Students were asked what their current major was: It would seem that the majority (39.4%) of the participants were matriculated in the Science Technology Engineering Mathematics (STEM) & Medicine related disciplines, followed by Business & Management (8.4%). Figure 3.1 below shows the frequency distribution by discipline.

Figure 3.1: Frequency distribution by discipline
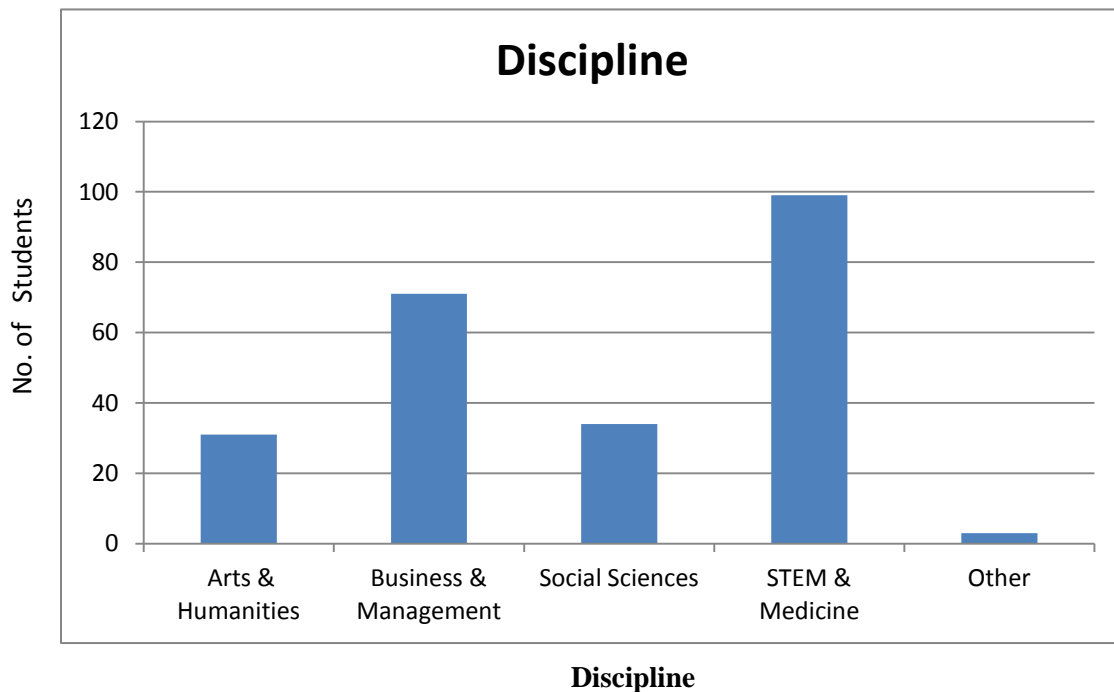
Source: Author's web survey data.

Languages:

A total of 246 out of 250 responded to the question regarding their native language. Thirty-three languages were represented. Table 3.1 shows languages that had 5 or more participants, with Chinese having the most students at 121 (48.4%). (See frequency distribution of the native languages represented in Table 3.2 below).

Table 3.2: Frequency distribution by native languages

Language	No. of Participants	% of sample
Arabic	9	3.6
Chinese	121	48.4
English	11	4.4
French	5	2.0
German	5	2.0
Hindi	6	2.4
Korean	7	2.8
Persian(Farsi)	11	4.4
Portuguese	12	4.8
Spanish	18	7.2
Other	45	18.0
Total	250	100.0

Source: Author's web survey data

Participants were asked to indicate what other languages they used or knew, and also indicate their level of proficiency for each. Not surprisingly, apart from their native languages, English was the language most respondents (94.4%) indicated that they used-with most reporting either an advanced or intermediate knowledge of it. 80(32%) Of the participants indicated that they are now or had attended ESL classes in the last 2 years compared to 167(66.8%) who indicated they were not or had not attended ESL classes in the last 2yrs. As expected, almost all the participants (92.4%) indicated that they

currently have English as their primary language of Instruction. However, it would seem that this has not been the case for too long with a good number of the participants, 60 (24%), indicating that they've had English as their primary language of instruction for less than 1yr and 61 (24.4%) for 1- 2yrs, averaging to just about 1 year for the sample. By contrast, only a few of the participants 24(9.6%) have had English as their primary language of instruction for 5-10years. (See frequency distribution in Figure 3.2 below.)

Figure 3.2: Length of time with English as primary language of instruction
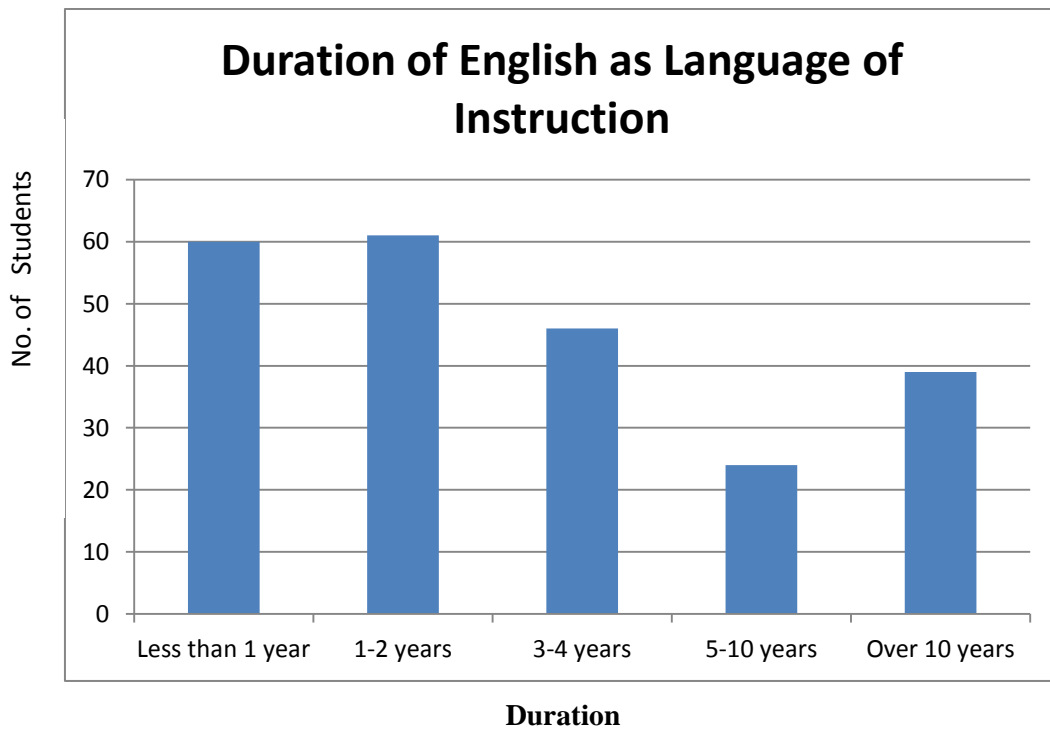
Source: Author's web survey data

Even though most of the respondents have not had English as the primary language of instruction for too long, most of them self-reported that their English proficiency was good to

very good, with 81(32.4%) indicating that their English proficiency was good and 80(32%) indicating that their English proficiency was very good. (See Figure 3.3 below).

Figure 3.3: Frequency distribution on self-reported English proficiency
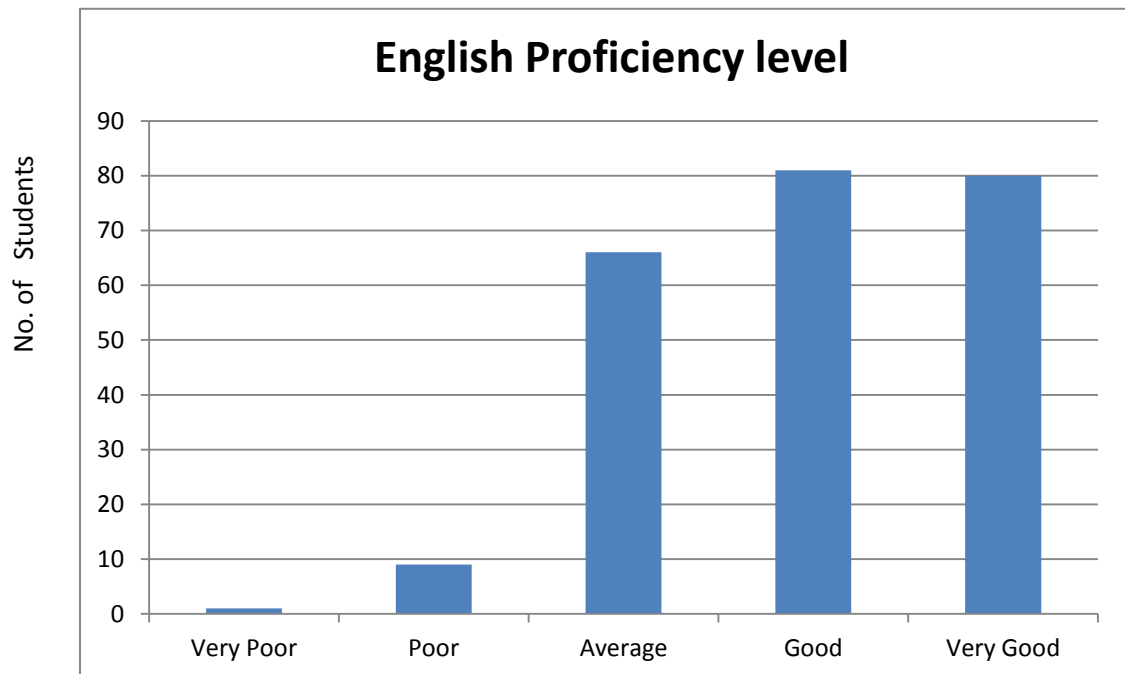
Source: Author's web survey data

3.5.2 Web survey section 2: Internet use

Google was overwhelmingly the preferred Search Engine; with 233(77.2%) indicating that they use Google, and 44(14.6%) selecting other. Most of those who selected "Other" typed in Baidu (a Chinese Search Engine) in the space provided. Even though some studies (e.g. Zhang & Lin, 2007) found that Google has by far the most language supports of most of the well-known English search Engines, the current study did not specifically investigate the reasons for search engine choice and whether any of these were language

related. When asked the question "Do you ever use any other languages (a part from English) for searching the internet and/or electronic databases?" 77(30.8%) responded "No" while 169(67.6%) indicated "Yes". When asked what language they used to search for information on the **internet** 45(18%) indicated they used English; 9(3.6%) indicated they used their native language, while 183(73.2%) indicated they used both. Slightly over half (58.4%) indicated they never needed to translate the results from their searches while 33.6% indicated that they sometimes needed to translate their results. Translation services was selected as the Multilingual Information Access (MLIA) tool they used most while searching for information online, with (62.3%) selecting this option; followed by (18%) who selected Non English Search Engines and (19.7%) indicated they used the Limit by language tool. Google translate (78%) was overwhelmingly chosen as the service they used for translation, mirroring the Search Engine choice results. Notable here is the fact that only 183 out of the 250 participants answered this question, perhaps an indication that some lacked awareness of the availability of these MLIA (Multilingual Information Access) tools on the internet or in electronic databases. When asked for what purposes they used the internet, a significant number reported that they used it for e-mail 227(95.4%); for research 221(92.9%) and 210(88.2%) for Social Media. (Frequency distributions for the question 'For what purpose do you use the Internet?" are shown in Figure 3.4 below).

Figure 3.4: Internet use: Purposes

Internet Use: Purposes
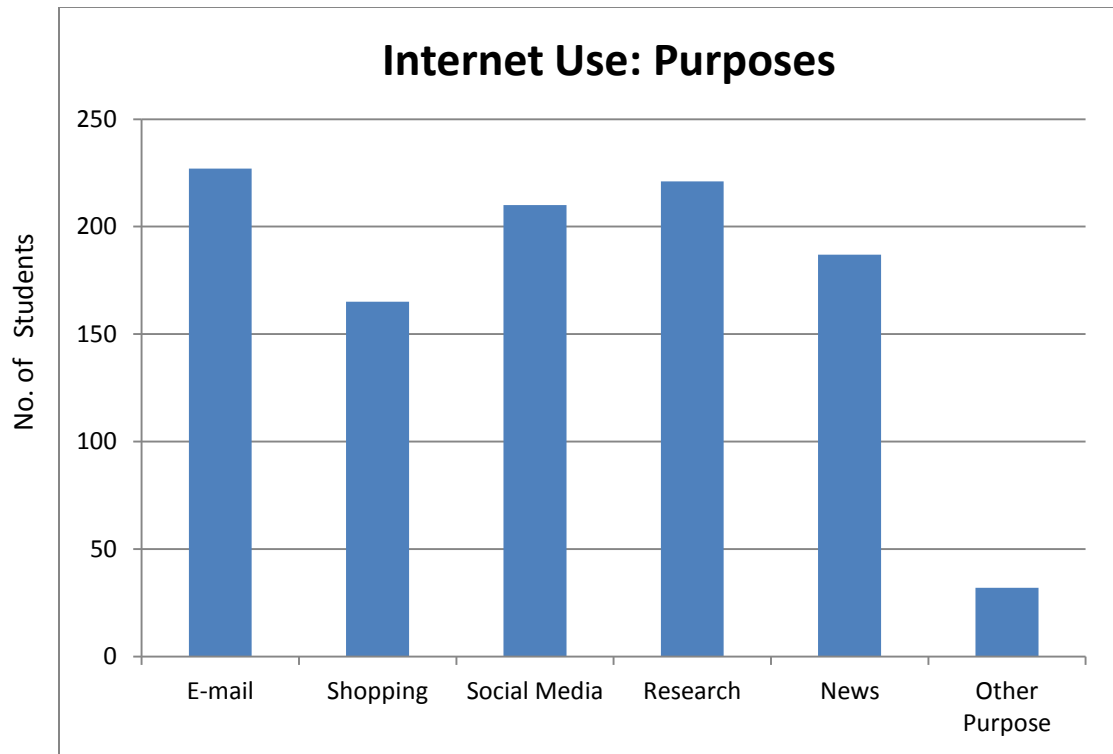
Source: Author's web survey data

3.5.3 Web survey section 3: Electronic database use

Database use experience varied, with most 82 (32.8%) indicating they have been using electronic databases for less than a year, followed by 53 (21.2%) who indicated they have used databases for 1-3 years. (See Figure 3.5 below).

Figure 3.5: Database use experience
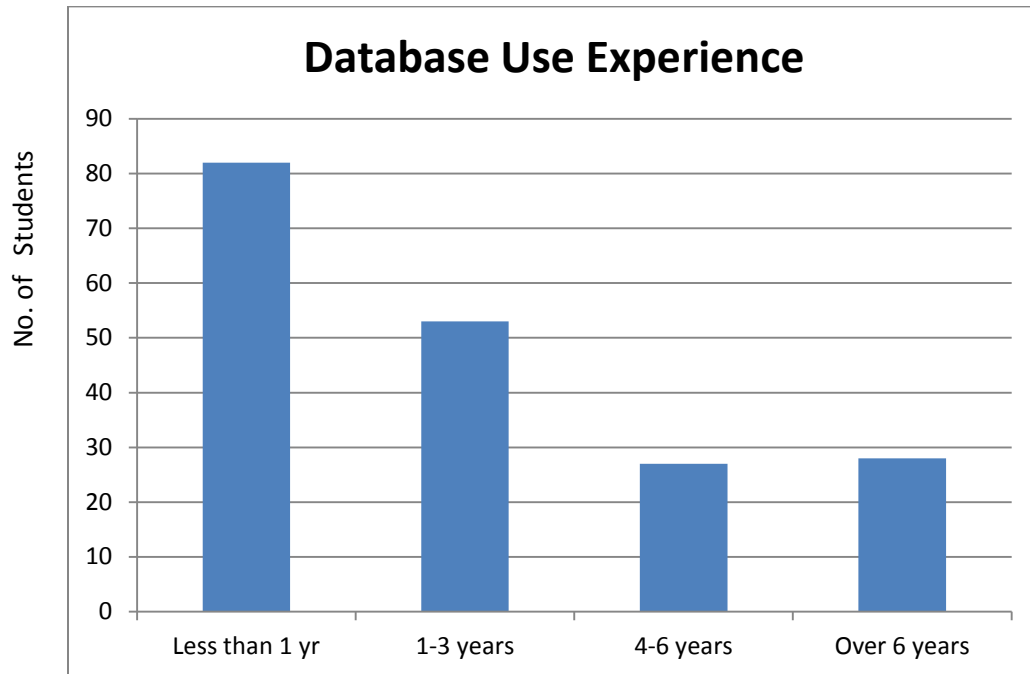
Source: Author's web survey data

When asked how they found out information about electronic databases, 121 (47.8%) indicated they found out information about library databases from their professor or instructor, followed by 88(34.8%) who selected librarian and 44(17.4%) selected classmates as their source. (Figure 3.6 below).

N.B. There was an option for "Other", which had very few responses; most who selected this response specified "library website" and this was counted as "librarian" source.

Figure 3.6: Electronic database information source

Electronic database information source

Classmates 17%

Class Instructor/ Professsor 46%

Librarian 37%
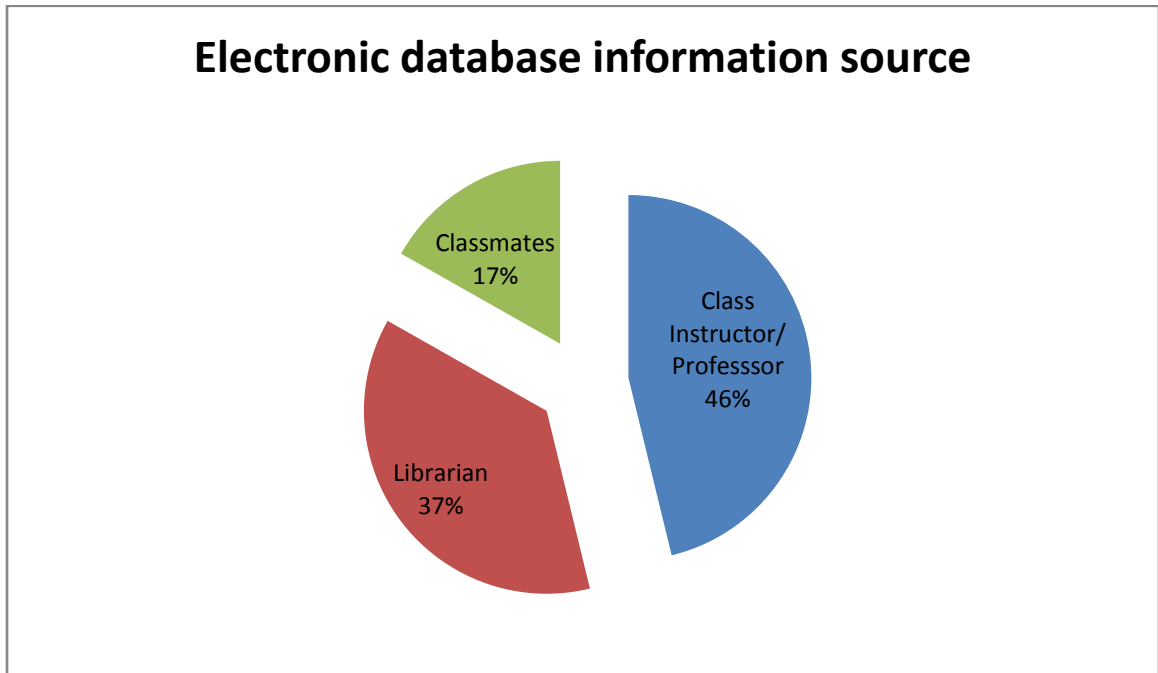
Source: Author's web survey data

When asked what language they used to formulate their search terms on electronic databases, 168 (67.2%) indicated that they used English, 14 (5.6%) indicated they used their native language while 16 (6.4%) chose both. These results were remarkably different from their responses in regard to using other languages when searching for information on the internet where 67.6% indicated they used other languages as well, while 30.8% responded "No". When asked if they translated their search terms from their native language before performing a search, 42.8% indicated they sometimes translated the search terms from their native language, while 37.2% selected "No" and lastly 20% selected "yes."

The final two questions asked the participants what kind of linguistic help they felt they needed most when searching for information online and what kind of library services they desired, respectively. As shown in Figure 3.8 below, "Finding more effective terms" was the most common help selected, followed closely by "finding the correct spelling" and " selecting search terms". The least selected option was "translating the full text". These results would seem to indicate that the participants required help the most at the query formulation stage while the challenges they would otherwise face at the later stages such as reading the information they retrieve may normally be mitigated for by machine translation. (See frequency distribution in Figure 3.7 below.)

Figure 3.7: Linguistic help needed by bi/Multilingual students
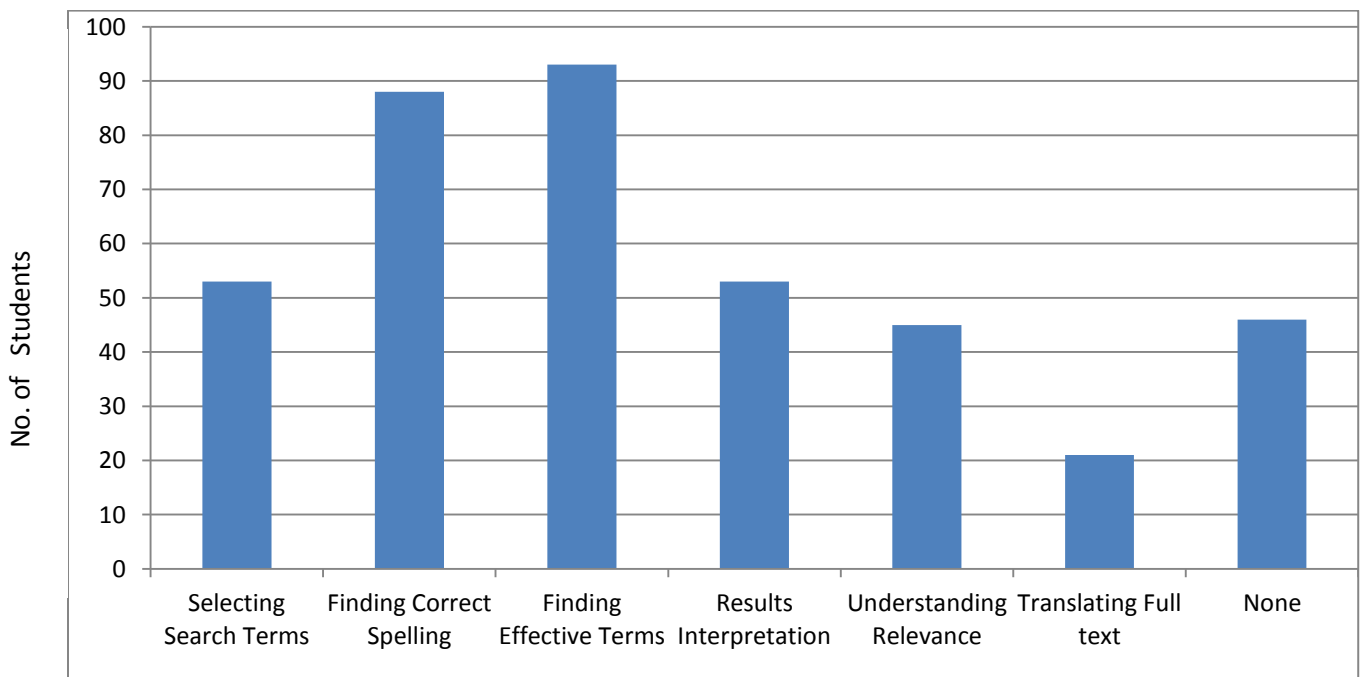
Source: *Author's web survey data*

Finally, the respondents were asked which library services they needed most. Library instruction was the most commonly chosen service followed closely by translation services and multilingual search options. (See Figure 3.8 on the next page).

Figure 3.8: Library services desired by Bi/Multilingual students
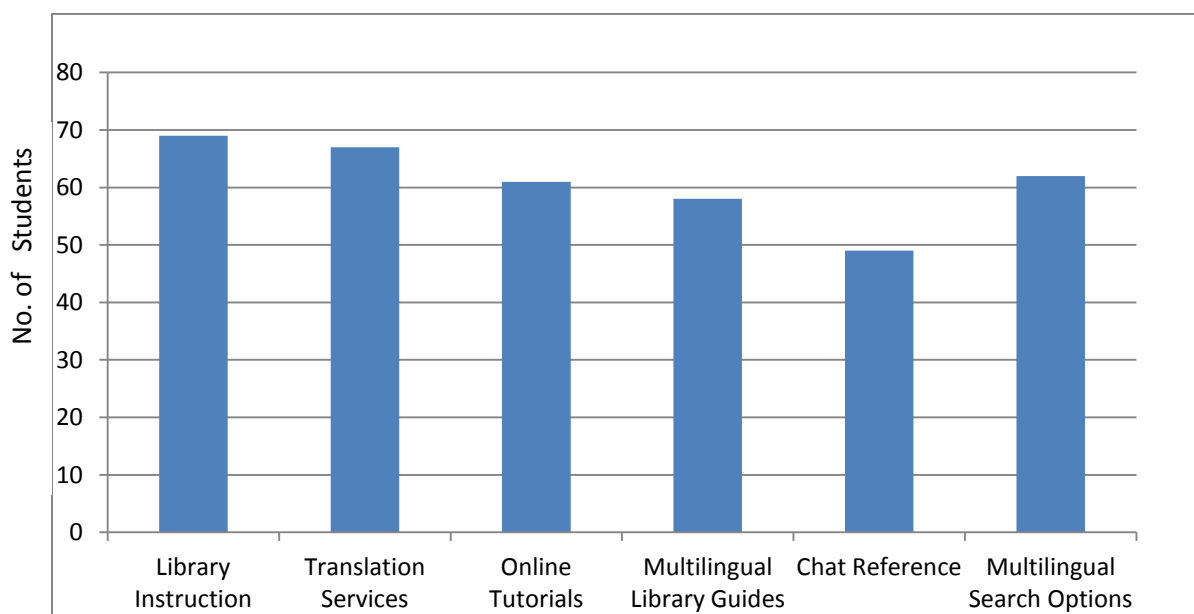
Source: Author's web survey data

3.6 Discussion

In this study, many of the bi/multilingual students (most of whom are non-native English speakers) reported that their English proficiency level was good. They also indicated a comfort level in conducting their searches in English. The language choices made by the students while searching for information on the internet seemed to indicate that the students used their native languages just as much as they used English. This is a reflection of the rising multilingualism and multiculturalism in the online environment and the fact that English is not as dominant as it was some years ago. However, these findings were different for the students' language choices when it came to searching for

information on electronic databases, with most (86%) indicating that they formulated their search terms in English. This may point to the lack of language choices/ tools available in electronic databases, and /or a lack of awareness by the students of the language tools available to them. However, it may also be an indicator that most scholarly research is still heavily published in English. In a study done at a University in Korea for instance, the scholars indicated that they preferred to use articles written in English; reasons given for this were that these sources were more readily available and that they trusted these sources more (Rieh & Rieh, 2007). As indicated by the results, machine translation was reported as the language tool that was used most by the students and was therefore identified as one of the coping mechanisms employed by the students in the linguistic related challenges they faced while searching for information online. This study corroborated results from other studies which found that technological advancements e.g. in machine translation has helped ease some of the language barriers (Hughes, 2005; Liao, 2007). However, as the findings of this study have shown, language barriers do still exist especially in the *process* of searching for information. While the respondents in this survey self-reported a high level of English proficiency, "finding more effective terms" (Figure 3.7) was the linguistic help most commonly chosen. While this may not entirely be a language related issue, 32 (61.5%) out of the 52 students who responded to this question also revealed that they *sometimes* translate their search terms from their native language into English before performing a search.

Diverging from previous studies (e.g. Allen, 1993; Schomberg & Bergman, 2012) that have used length of stay in an English speaking environment (in this case United States) as a determinant in the level of English proficiency, this study used attendance in ESL

classes and number of years of having English as the primary language of instruction. Enrolling in ESL classes was used as a proxy measure because as part of admission requirements, students whose first language is not English are required to provide proof of English language proficiency by providing acceptable scores from certain tests such as TOEFL (Test of English as a Foreign Language); IELTS (International English Language Testing Service) or CAEL (Canadian Academic English Language Assessment)[1]. Those who are not able to prove English language proficiency and/ or are not able to get exemption through other means are given a conditional offer of admission pending the successful completion of certain levels of the ESL program a the English Language Centre at the University of Western Ontario or the ESL program at Fanshawe College. While length of stay might have a significant impact on the language used in social interactions, or interactions with librarians, length of having English as primary language of instruction would seem to have more influence on their online information searching behavior especially on electronic databases: an analysis of several patterns in the study seemed to confirm this: The fewer the years of having English as the primary language of instruction, the more likely the student was to use a non- English language for searching the internet. However, even though most of the students have not had English as language of instruction for a long time (average was 1yr), most (92.9%) chose English as their preferred language for formulating search terms in electronic databases. This finding corroborates that of other studies e.g. (Rieh & Rieh, 2005; Petrelli, 2004) that found that often, users' search language choice was not based on proficiency but on the task at hand.

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[1] Source http://grad.uwo.ca/prospective_students/applying/admission_requirements.html#english

3.6.1 Implications for LIS professionals

The findings from the section on the library services desired could provide important information to academic librarians regarding what kind of services this user group desires or what kind of services could be beneficial to them. In this study, the three top choices that the students selected were library instruction (37%) translation services (36%); and multilingual search options (33%). Additionally, when asked which of the MLIA (Multilingual Information Access) tools students had used, most (62%) selected Translation services. Many of the participants skipped this question; this could point towards the fact that many are unaware of the MLIA tools available to them and so do not use them regularly. Librarians could help raise awareness of the existing MLIR technologies on the internet and in electronic databases and also show students how to use them. In some databases, translation options need to be enabled by an administrator and librarians need to make sure these kinds of options are readily available to users. Most (70%) of the participants indicated that they had heard about electronic databases from their professors. While this is not necessarily a negative indication, academic librarians need to take on the challenge of being at the forefront in regard to information access issues and initiate collaborations with faculty, ESL departments and international students' offices to make sure they're *customizing* the information literacy instruction to fit the needs of these users. Though not relevant in this study, findings gleaned from studies that examine database use patterns could be used to inform librarians where efforts need to be increased- e.g. by department or discipline. User-focused studies such as this one are key in developing a framework for LIS professionals in teaching information literacy and library skills for bi/multilingual academic users: As Ishimura

and Bartlett (2014) suggest, students' perceptions could be an important and objective addition to librarians' self- assessment of information literacy teaching skills.

3.6.2 Implications for IR system designers

Judging from the types of support / services the participants indicated they needed most i.e. "Finding more effective terms", "Finding the correct spelling", and "Multilingual search options", it would seem that they would need functionalities that could support them mostly at the query formulation stage of the IR process. Such findings could be used in developing models that correctly represent the information searching behavior of bi/multilingual academic users. These findings also suggest that Cross Language Information Retrieval (CLIR) search options as well as multilingual thesauri are functionalities that hold considerable promise in helping alleviate language barriers at the query formulation stage. This is because the user would then be able to enter search terms in their preferred language and still be able to retrieve documents in any of the languages that are supported in the system. So for instance, even if users enter terms in English, they would still be able to retrieve documents in their native languages as well. By the same token, they could enter search terms in their native language and still retrieve documents in English, and other languages that are supported in the system. Finding effective terms is not a unique problem to non- native English speakers and just as controlled vocabulary helps users refine their search, a multilingual thesauri that presents terms side by side in the users' preferred languages could help them in finding more effective terms and also in finding the correct spelling. Of considerable note is the fact that few students chose "translating full text" as the linguistic help they needed while searching for information online. This finding may support what other studies have found

i.e. that language barriers in the online environment are easing up due to technological advancements such as machine translation. It could also be an indication of their proficiency in English which they rated on average as "good". Their language proficiency could also explain why a number of them chose "none" on the question about the linguistic help needed while searching for information online. Perhaps efforts could be shifted to improving the translation quality in machine translation as this also affects the Cross Language Information Retrieval (CLIR) functionality.

3.7 Conclusion and future research

The limitations of the traditional usability framework, which focused mainly on user cognition and user performance in human-technology interactions, are now being acknowledged by many HCI researchers (Law et al, 2008). This has led to an increasing interest in user experience research and thus highlighting non-utilitarian aspects of these interactions, such as user emotions, sensation, perceptions, opinions, affect, and the meaning as well as value of such interactions in everyday life. (Law et al, 2008). In MLIR research as well, the focus is shifting to a more user centered approach that emphasizes user experience and user perception: the emphasis is less on the language proficiency (primarily English) of the user or their search expertise and instead researchers are looking more towards developing Personalized Multilingual Information Retrieval models (PMLIR) (Ghorab et al, 2011; Steichen et al, 2014) that take into consideration factors such as users' browsing and search behavior.

In this first phase of a study exploring the information searching behavior of bi/multilingual academic users, the findings show potential for providing valuable information to aid LIS professionals and MLIR system designers on where best to

concentrate their efforts and investments. The next phase was an experiment where bi/multilingual users were given the opportunity to use various Multilingual Information Access (MLIA) tools and their searches recorded. The third phase aimed at delving deeper into understanding the information searching behavior of these users and involved focus group discussions where the users were encouraged to express their opinions on current MLIR technologies they were familiar with as well as library services that they were currently receiving. This phase also involved interviews with academic librarians who also shared their perspectives on multilingual information literacy and their views on serving this group of users. Future research goals include carrying out more user centered studies aimed at providing empirical evidence that could support the usefulness of CLIR search options and multilingual thesauri and documenting how these improve the search experience of the user, and lead to more effective/ successful searches.

Even though the study's results are not generalizable- the findings are transferable to other libraries in other similar higher education institutions. Since the study deals with linguistic challenges encountered in the online environment, it is applicable to internet users worldwide and not just international students or ESL students at a Canadian University. Furthermore, although the examples used were mainly drawn from English as a Second Language, they're applicable to any user who is trying to access information in a language they may not be fully in which they may not be proficient.

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CHAPTER FOUR

Experimenting with Multilingual Information Access (MLIA) tools on Google and WorldCat: Bi/multilingual students' experience and perceptions

4.1 Introduction

The online information environment is increasingly becoming multilingual and multicultural; however, statistics show that even though most of the world's internet users are non- English native speakers, most of the content on the internet is in English (World internet statistics, 2014; Web Technology Surveys, 2014). Even though English has seen a decline in its dominance in terms of web pages offered in English, the percentage still stands at 55.7%, compared to the next language, German, at 6.1% (Web Technology Surveys, 2014). Additionally, many digital libraries now exist, with many of them offering access to multilingual content. The problem presented in this scenario has been for users to access and use content that is in a language in which they're not proficient. This is a prevalent challenge mainly for Limited English Proficient users. However, advancements in technology especially in Natural Language Processing (NLP) applications now offer potential for alleviating these problems.

Multilingual Information Access (MLIA) refers to accessing, querying and retrieving information from collections in any language at any level of specificity while Multilingual Information Retrieval (MLIR) a narrower term, refers in general to the processing of information in multiple languages (Peters, Braschler & Clough, 2012). The retrieval of information in a MLIR system may be monolingual or across languages. Technological

advancements especially in machine translation, have made it possible for people to access information in languages they may not be familiar with, but while machine translation can help users to read content written in a foreign language, on its own it is inadequate in actually helping them *find* such content. This research attempts to examine all stages in the information searching/ retrieval process and the interactions of the user with system with an aim of identifying the impact multilingual information access tools could have on this interaction. Consequently, in addition to machine translation other tools such as CLIR (Cross-language information retrieval), multilingual interfaces, virtual keyboards, and multilingual thesauri are considered as well.

Experiments are commonly used in Interactive Information Retrieval, usually to examine the difference between two or more systems or interfaces on some set of outcomes. In MLIR research as well, previous research focused on laboratory experiments entailing physical system development, for example, development of translation techniques for query translation or content (document) translation using various methods: ontology, machine translation lexicons, bilingual dictionary and corpora machine translation (Oard, 1997). However, in recent years, as is the case with interactive information Retrieval (IIR) as well, more emphasis has been placed on user studies that would lead to understanding users, their typical information needs and how they interact with IR systems. Gey, Kando & Peters (2005) for instance, proposed that the future of MLIR research should bring more attention to end-user issues such as "results presentation and multilingual question answering" (p. 424).

Multilingual information access tools make it possible for users to access multilingual content in an online environment. Examples include: multilingual interfaces, machine translation, multilingual thesauri, cross language information retrieval search options, virtual keyboards,

localization, internationalization, and country specific search engines. Their functionality,

including at which stages they would be most useful are summarized by the author as shown

below:

Table 4.1: MLIA tools: IR stages & functionality

MLIA TOOL	IR Stage	Functionality
Multilingual interface	Query formulation Assessing Relevance Query reformulation and adaptation	Helps users adapt to the system. Helps users understand search options/ how to enter their query and how to limit or expand their query. Helps users interpret/understand information in records retrieved- e.g. bibliographic information.
Virtual keyboard	Query formulation Query Reformulation and adaptation	Helps users when they need to enter non-roman alphabets or specialized characters and diacritics.
Multilingual thesauri	Query formulation Query Reformulation and adaptation	Helps users when they need to use controlled vocabulary, to find more effective terms, or terms that could help narrow or expand their search
Online bi/multilingual dictionaries	Query formulation Query reformulation and adaptation, Reading retrieved results	Helps users in selecting terms, translating and understanding terms and information retrieved
CLIR Search options	Query formulation, Query reformulation and adaptation	Helps users enter terms in the language they are most comfortable with and still find information in all the languages supported by the system
Machine translation	Query formulation Assessing relevance Query reformulation/ adaptation Reading results retrieved Browsing support	Helps users formulate and/or translate terms. Helps users read information retrieved
MLIR	Query formulation Query reformulation and adaptation Assessing relevance Reading results retrieved Browsing support	Helps users use/ retrieve information in all the languages they desire to read the information in and that are supported by the system. Enables more users to access the information
Localization/ internationalization	Browsing support Reading information retrieved	Vocabulary/ terminology, interfaces, icons etc. are adapted to specific regions, cultures so as to increase understanding by the user.

4.2 Related work

In the online environment Limited English Proficient (LEP) users do face language barriers while searching for information. These barriers are associated both with the process of searching for information and the use of the information retrieved. Thus, formulating effective search terms, assessing the relevancy of retrieved documents and reading the information retrieved may pose challenges for users, depending on their proficiency in the language they are trying to access documents in. There have been a number of studies that have documented these challenges. The studies have used different methodologies including experiments with real users, log analyses, surveys as well as observations with interviews. In a comparative study of English and Swedish users Hansen and Kalgren (2005) found that for each of these groups, foreign language texts took longer to assess and were assessed less well. Other studies have also underscored the importance of localization, noting that language differences can sometimes embed cultural differences and thus further complicate the search process and the evaluation of results. For instance, Lazarinis, Ferro and Tait (2007) evaluated web search engines and their handling of Greek Language queries and found several deficiencies: "a lack of localization of the interface, a lack of support with searching tips e.g. correcting misspelling and poor handling of diacritics, stop words and stemming- resulting in poor retrieval performance." (p.74).

Evaluation in Multilingual Information Retrieval (MLIR) has largely been carried out through the Cross Language Evaluation Forums (CLEF) campaigns. These evaluations, often involving experiments, are carried out in controlled laboratory environments, with test collections; and mainly focus on system evaluation. Within the interactive Cross

Language Evaluation Forums (iCLEF) campaigns, many of these studies have used log file analysis to collect user data (Gäde, 2011; Ghorab et al, 2010; Vundavalli, 2008; Berendt & Kralisch, 2009). To date, there is a paucity of MLIR evaluations involving experiments with real users interacting with the system. Nevertheless, some studies that have used user-experiments are documented in the literature, with most of these concentrating on Cross Language image retrieval (Clough & Sanderson, 2006; Petrelli & Clough, 2012; Vassilakaki, Johnson & Hartley, 2012). Examples of user experiments involving cross language text retrieval include a study done by Chung et al, (2008) involving 30 Chinese students from the University of Arizona. The study evaluated the performance of a Chinese Business Intelligence Portal (CBiz-Port), a meta-search engine that searches for business information of mainland China, Taiwan, and Hong Kong, and compared it to other search engines used in the region. Additionally, the study sought to find out what the participants' impressions and perspectives were of the different features the system offered. These additional functions provided by CBizPort include: encoding conversion (between Simplified Chinese and Traditional Chinese), summarization, and categorization. In this study, comments from the participants indicated that CBizPort performed best in terms of analysis functions, cross-regional searching, and user-friendliness, whereas regional search engines were more efficient and more popular. Participants also indicated that they especially liked CBizPort's summarizer and categorizer, which helped in understanding search results (p. 818). Through the *Clarity Project,* Petrelli et al (2004, 2008) used a number of user experiments in the design and evaluation of a Cross Language Information System (CLIR) system called CLARITY. At the design stage, they involved business analysts, journalists, librarians, and

translators to gather information on these users' needs/ requirements and also information on how they interacted with the system. Their study yielded valuable information that bears implications for the design of different aspects of CLIR systems such as the user interface, information retrieval functionalities, translations as well as the cross-language task. User evaluations were then used for the same system, and the experiments at this stage also yielded important information that helped refine / improve the system by testing the effectiveness of each component of the complex system. Additionally, by cumulating the results of all the 43 participants that were involved, it enhanced their knowledge of the potential, impact and actual use of CLIR technology. Also, the user evaluation offered the advantage of helping them understand the *why* and not just the *what*. More recently, Wu, He & Xu, 2012 employed user experiments on the ICE-TEA system (English/Chinese) to investigate the effectiveness of two relevance feedback techniques- Query Expansion and Translation Enhancement. Their study involved 54 students from the School of Information Management and other schools at Wuhan University. Participants assessed the retrieval effectiveness when the search is performed using the relevance feedback techniques mentioned above. Search logs from the experiment were also analyzed to examine users' behavior. Results from the study showed that significant improvement in retrieval effectiveness could be achieved by combining query expansion with translation enhancement (as compared to a case when there is no relevance feedback). In a study exploring which users would benefit from CLIR in web retrieval, Airio (2007) reported that users with good to moderate/ passive target language skills would benefit from query translation while those with poor target language skills could benefit from both query and document translation. Other studies

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have examined how users could benefit from bi/multilingual thesauri (Jorna & Davies, 2001; Shiri et al, 2011): in a comparative evaluation study that examined users' attitudes, impressions and thoughts about two user interfaces that support multilingual searching through the use of multilingual thesauri, Ruecker, Shiri and Fiorentino (2012) found that users differed in their preferences for the two systems based on their cognitive styles.

All the aforementioned studies emphasize the importance of user experiments in evaluating specific aspects of Interactive Information Retrieval (IIR) systems and in gaining an understanding of users' information searching behavior. As Ruthven (2008) affirms, "the strength of good research" in interactive information retrieval comes "not only from a technical knowledge of interactive systems development but also from a knowledge of people's search behavior and search context, including the environmental factors that influence behavior" (p.44). All the studies mentioned above were limited to one MLIA tool and in most cases used systems that are not publicly available. The current study seeks to build on, and enhance these previous studies by investigating various MLIA tools and how they affect the information searching behavior of bi/multilingual academic users. Moreover, the study uses two systems that are publicly available and commonly used.

4.3 Research Questions

In the current study, an experiment involving bi/multilingual users is used to explore what effect the availability and use of multilingual information access tools will have on their online searching behavior. Specifically, the study explored the following research questions in the context of multilingual information online searching:

1. How does the availability and use of multilingual information access tools affect the information searching behavior of bi/multilingual academic users?

2a.How does the type of task affect language choices made by the user during a search?

  b. How does the language the task is stated in affect the choices made by a user during a search?

4.4 Methodology

A controlled lab-based user study was carried out over 5 sessions involving bi/multilingual students searching for information on two systems namely Google and WorldCat. The test persons in the experiment were bi/multilingual international students from the University of Western Ontario and its affiliated colleges (Brescia, Huron College University and Kings University). In addition to English, the participants were expected to be proficient in one of the other languages used in the experiment i.e. Chinese, French, German, Korean and Spanish. Participants could choose from 3 different dates when the experiments were to be carried out.

4.4.1 Search Tasks

Participants were asked to conduct 4 searches; two searches involving technology shopping tasks on Google and two searches involving academic research type questions on WorldCat. The tasks could be performed in any order, and after completing the searches, participants were requested to fill out a post experiment questionnaire. The experiment used the ultra-light interactive IR methodology as posited by Ingwersen (2005). This methodology is recommended for investigations that in principle involve information seeking activities in that it offers the researcher two alternative research

design approaches namely (1) applying assigned search jobs by using either topics or simulated work task situations and (2) applying real-life natural search jobs generated by the test persons themselves (Ingwersen, 2005).   In order to simulate possible query input using keyword style input as well as natural language formulations, the experiment used structured topics. Even though the users were allowed to formulate their queries in their own words, the requests were given to them in order to keep the investigation under control. For each of the systems, at least one of the queries was given in their native language; this was so as to observe the language choices the participants will make in different scenarios, and their use of MLIA tools in these scenarios. Assigned tasks were deemed appropriate in order to control the search situation while also allowing for comparisons (Kelly, 2009). Since language issues such as vocabulary were of particular interest in this study, assigned topics would help keep some aspects of the investigation under control, but also ensure conditions where comparisons could be made e.g. between searches with the same task type, but where one was stated in English and the other stated in the native language. Tasks were also selected to elicit exploratory behavior; Wildemuth and Freund (2012) recommend that search tasks should have certain attributes e.g. they should focus on learning and investigative search goals; be general rather than specific, be open-ended, targeting multiple items/documents,   involve uncertainty and be accompanied by other information or cognitive behaviors, such as sense-making or decision making. In the technology shopping tasks of the experiment, participants had to try and understand the different features of the items (sense- making) and then finally make a decision regarding the specific smart phone and laptop to purchase, and where to purchase it. The academic tasks on WorldCat were focused on the goal of learning and

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situated within an academic / research context where participants were to retrieve

multiple items. The tasks are described in detail below; for the translations of the tasks,

see Appendix B.

Topic 1. Shopping- Electronics; System: Google

Tasks 1A: Shopping: Smart Phone

You are looking for information to help you purchase a Smartphone. You are interested

in finding reviews of different smart phones and also in finding a reliable dealer. The

smart phone should have basic features such as GPS navigation and a good camera.

Task 2A: Shopping: Laptop

As in Task 1A, participants searched for information to help them arrive at a decision in

choosing a laptop and where to buy it. The instructions for this task were given in the

respective languages used in the experiment- i.e. Chinese, French, German, Korean and

Spanish.

Topic 2: Environmental studies; System: WorldCat

Tasks 1B: Global warming

You are taking an introductory course in Environmental Studies. For your final paper,

you have been asked to choose a topic that is of interest to you. You have chosen to write

a paper on Global Warming and are looking for information in different formats- i.e.

books, websites and articles so as to find information that covers both the current aspects

of the topic as well as general introductory, but scholarly information about the topic.

You decide to start your search in WorldCat as it will give you information on where to

borrow the books that you need, or how to access articles that may not be readily

available on the Internet.

Task 2B: Wetlands

Instructions for this task were similar to task A, and were given in their native language

or the respective languages that were used in the experiment i.e. Chinese, French,

German, Korean or Spanish.

4.4.2 Systems

Even though CLIR (Cross-Language Information Retrieval) research has intensified in

the last couple of years and continues to increase, it is a service that is offered by few

information systems. Gey et al (2006) have suggested that translation performance may

be the major obstacle in applying these technologies to practical systems.   However, the

technological advancements in the last few years in NLP applications such as machine

translation have led to practical applications of CLIR systems on the web, in electronic

databases and in digital libraries. The IR systems that were used in this study were chosen

because they contain most of the MLIA tools that the participants were introduced to in a

video tutorial. An attempt was made to choose from two different categories of IR

systems- a search engine, and a bibliographic database. The IR systems chosen are:

Google Search Engine, and WorldCat.

Google Search Engine

Studies on web user patterns have consistently shown that some users often need to access

information in another language other than their native language (Rieh & Rieh, 2005; Aytac,

2005). However, despite this obvious need for multilingual information retrieval tools on the

web, few search engines provide a cross-language search to help in retrieving information across languages on the web. Zhang and Lin (2007) investigated multiple language support features in 21 search engines: they summarized the characteristics and functions of these search engines in the following five aspects: the number of supported languages, visibility of language support, translation ability, result presentation, and interface design. They identified Google as the regular search engine with the best multiple language support (p.530). Currently, Google offers a translation service through Google Translate which supports translation services (both text and speech) for over 90 languages. Additionally, users are able to conduct monolingual searches in their preferred language or country, and machine translation is provided for texts that the user may enter or paste directly into a text window. Translation of an existing web page and an online dictionary look up feature are also available. A cross language search is also supported on Google. Given that Google seems to provide the most number of language features or services, it will be used for tasks that involve performing a search on a search Engine.

WorldCat:

The bibliographic information retrieval system chosen for the experiments was WorldCat, a global network of library content and services that includes over 2 billion records from over 72,000 different libraries worldwide.   It provides information in a variety of formats, including books, articles, internet resources, computer files and audio visual materials. According to their website, WorldCat provides multilingual access to information in over 470 different languages. It also offers other multilingual access tools such as multilingual interface, support for non-roman alphabet characters, limited cross language information retrieval (CLIR) search options, and limiting by language.

4.4.3 Experiment design & procedure:

A within subjects design with investigations of short-term IR interactions consisting of 4

retrieval runs was used. Participants were expected to perform searches for 2 tasks in Google

and 2 tasks in WorldCat. In total, 31students participated in the experiment with each

performing 4 searches, resulting in 124 captures (n=124). See overall design in Table 4.2

below:

Table 4.2: Overall design of the experiment

Participant 1-31	Assigned Task	System	Language of Search Query	Search No. (Unit of Analysis)
1	1A	Google	English	1
	1B	World Cat	English	2
	2A	Google	C/F/G/K/S*	3
	2B	World Cat	C/F/G/K/S	4
.				
.				
.				
31	1A	Google	English	121
	1B	WorldCat	English	122
	2A	Google	C/F/G/K/S	123
	2B	WorldCat	C/F/G/K/S	124
Total Participants = 31	-	-	-	**Total searches N= 124**

* Chinese/French/ German/ Korean/ Spanish

All experiments were carried out in a computer lab at the Faculty of Information Studies

at the University of Western Ontario campus. There were a total of 4 sessions consisting

of 6-10 participants. Participants started the experiment as they came in; there was no

time limitation for the experiment. Participants received the instructions for the

experiment and a post experiment questionnaire to be filled out. They began by watching

a video tutorial on using MLIA tools on Google and WorldCat (see Appendix B) and

then proceeded to do the searches. Their interactions with the system were then captured using screen capture software- (Camtasia® studio).   The computers had access to three screens that were available for the participants to access easily- the video tutorial, a Google advanced search screen and a WorldCat advanced search screen. Participants could go back to the video and watch it any time during the experiment; the advanced search screens were made accessible to the participants so they could easily access the limit by language feature on the systems. The researcher and an assistant were present at all times to answer any questions the students had. Participants were simply introduced to the MLIA tools but there was no obligation to use them. They could choose to experiment with these tools, use the ones they were already familiar with or not use them at all.

After completion of each task or during the task, participants were asked to fill out the corresponding questions regarding the results of their search. After completing all the four searches, participants were then asked to fill out a short post-experiment questionnaire. No time limitation was given for the experiment process and the participants were instructed that for each query, their job was to retrieve as many useful documents as they felt were necessary to fulfill their hypothetical information need, rather than to retrieve as many relevant documents as possible.

4.5 Results and findings

In order to obtain a more complete picture of the overall usefulness of MLIA tools in an operational setting while taking into account the wider information searching behavior of the participants, both subjective and objective measures were used. Examples of subjective usability measures (mainly from self-reported data from the post experiment

questionnaire) that were assessed included: ease of use and usefulness of MLIA tools, user satisfaction scores on each of the tasks and users' preferences on whether or not to use MLIA tools. Objective measures that were analyzed from the experiment captures included: time taken to complete each task, language the search was done in, MLIA tools used and search strategies used.

The user-oriented approach to information retrieval also suggests that rather than evaluating individual items as to relevance, the result of the overall retrieval service should be evaluated; therefore in this experiment, users were asked to rate, on a five point Likert scale three aspects of their search experience: the results of each search task, the overall usefulness of the MLIA tools, and the ease of use of MLIA tools.

4.5.1 Findings from the captures

The language representation for the experiment was as follows: 24 (77.4%) Chinese, 3 Spanish, French and German each had 2, and 0(zero) Korean participants. The search for each task formed the unit of analysis for this section. Each capture was analyzed for information that would reveal information searching behavior of the participants, and the data was also analyzed with a view of finding out if there were any patterns that could be observed from the captures. English was exclusively used in 72 (58.1%) searches; 45 (36.3%) searches were in both English and native language while only 3(2.4%) made use of only the native language. The search language was the language used by participants to perform the tasks regardless of the search strategy employed. Most participants chose to use keyword searching and they chose to use English to enter their key terms. Search language choices are represented in Figure 4.1 below:

Figure 4.1: Search Language Choice:
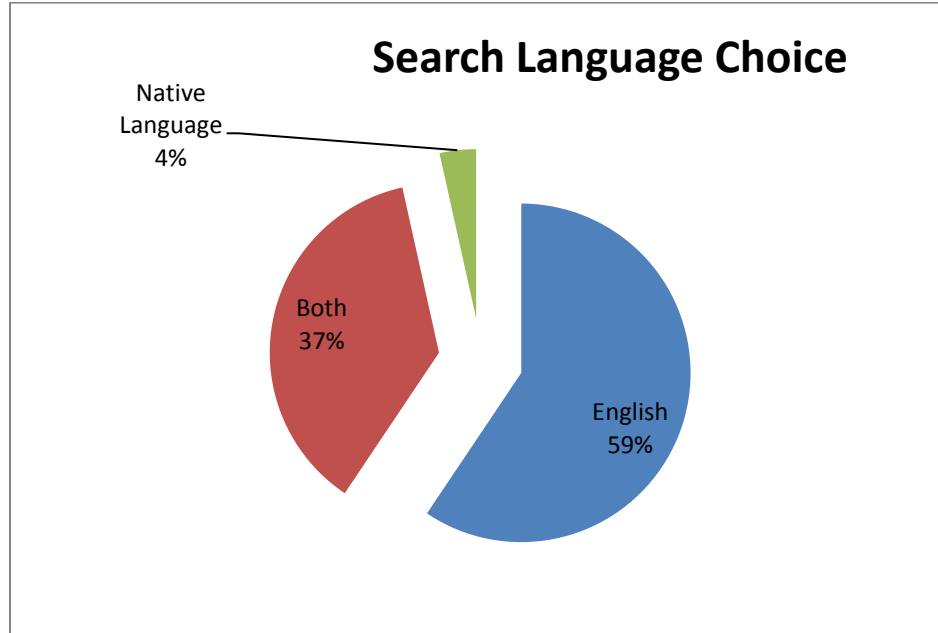
Source: Author's Experiment data

Each search task (n=124) was analyzed for use of MLIA tools. 4 Captures from one of

the participants were damaged and were therefore not included in the analysis. As shown

in the pie charts in Figure 4.2, a majority, 26 (86.7%) out of the 30 participants used

MLIA tools while 4 (13.3%) did not use any MLIA tools during their session. 78 (65%)

of the search tasks were completed using MLIA tools while 42 (35%) did not make use of

MLIA tools. The search language (as defined above) impacted the use or non-use of

MLIA tools. Not surprisingly, participants were most likely to use MLIA tools when they

used both languages during their search: 34 (43.6%) of the tasks with *MLIA tool use*

were done in English only, 3(3.8%) in the native language and 41 (52.6%) were done

using both languages. The frequency of use for *each* of the MLIA tools is represented in

the bar chart (Figure 4.3). From the bar charts, the MLIR feature was the most commonly

used MLIA tool at 43.5% followed by limit by language tool at 40.3%; while virtual

keyboard and non- English search Engines (notably Baidu) received the least use at just

4%. A possible reason for lack of use of virtual keyboards (intended to help with

entering non- roman alphabet characters) could be that participants used other methods of

entering Chinese characters that they were already familiar with; a possible reason for

lack of use of non- English search Engines could be because none of these (apart from

non-English versions of Google) were presented as options for use in the experiment and

participants may have felt that they needed to use Google and WorldCat only. One

participant asked during the session if they "have to use Google" to which the researcher

responded that they could use non- English search engines if they preferred. In the other

comments section on the post experiment questionnaire, some participants noted that in a

real life situation, they would not restrict their search to just Google or WorldCat but

would use other search engines for their shopping tasks and other electronic databases for

their academic searches.

Figure 4.2: Use of MLIA tools

Use of MLIA tools by search task n=120

No
35%

Yes
65%
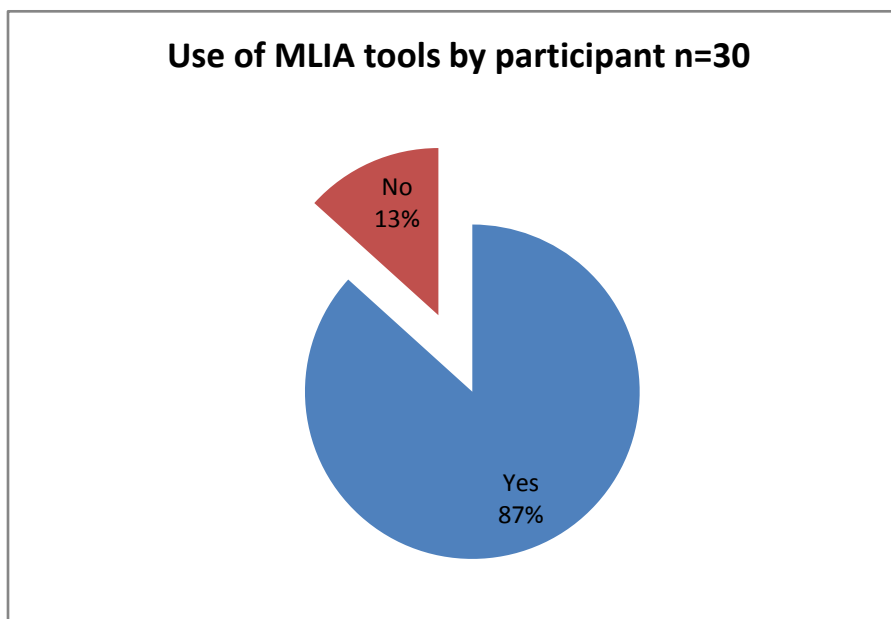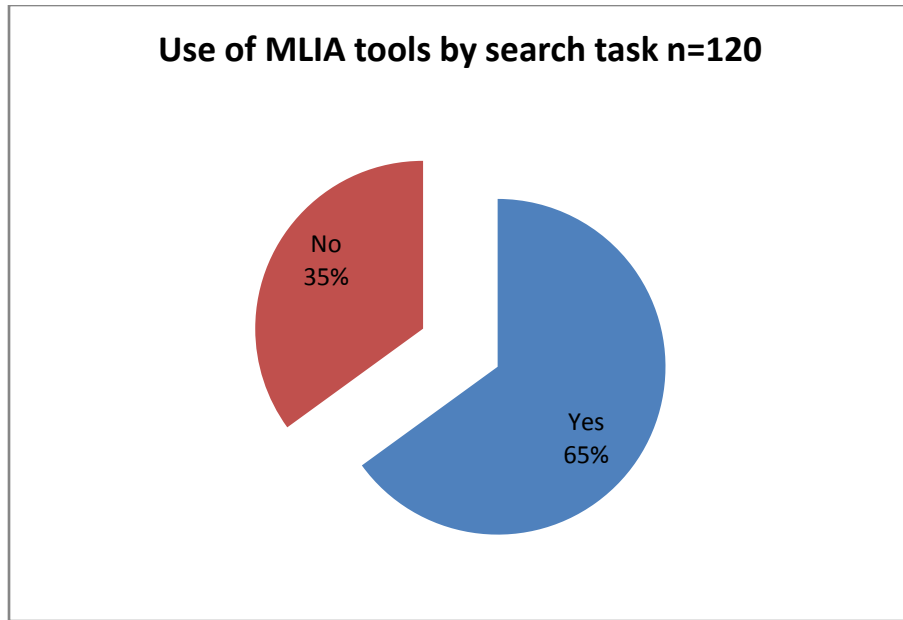
Source: Author's Experiment data

Figure 4.3: Use of MLIA Tools by Type
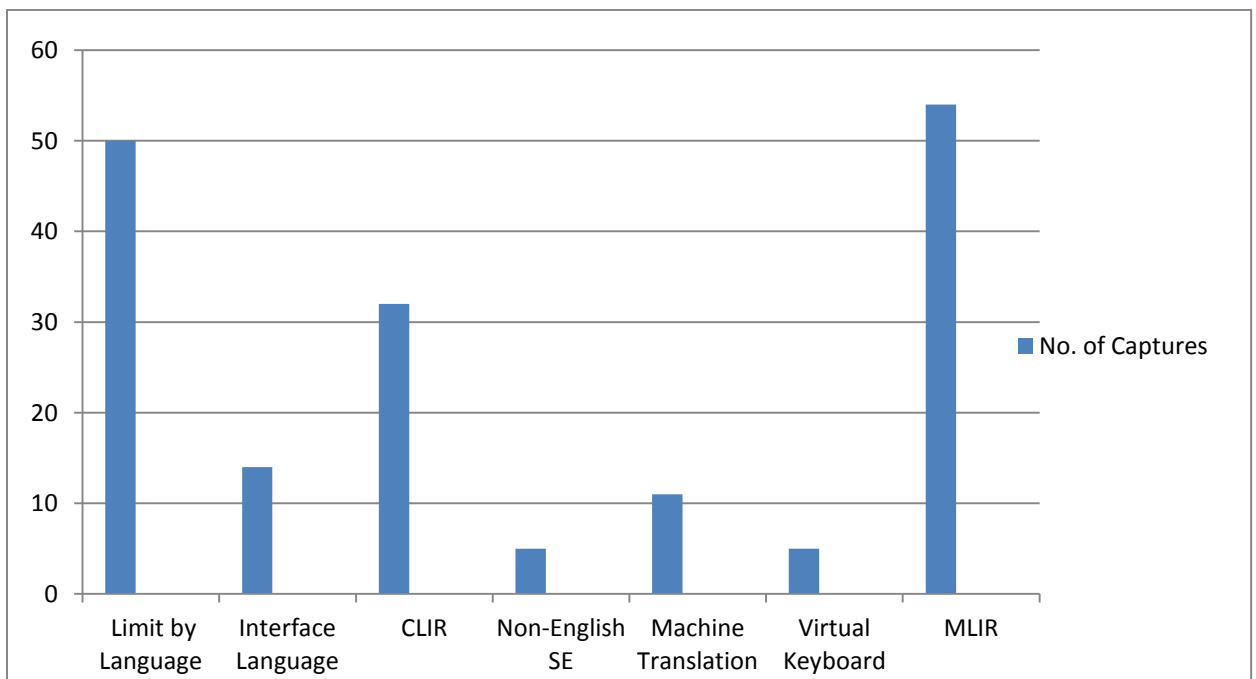
Source: Author's Experiment Data

Examples of MLIA tools use

The captures were analyzed to find out if there were any emerging patterns of MLIA tool use among the participants. Results revealed differences in usage even of the same tool; and within the same language pairs. For example, even when CLIR was used, the keywords entered differed with some participants entering additional limiting factors: For example, a search for "smartphones" limited to Chinese pages yielded different results from a search for "smartphones in Canada" limited to Chinese pages. Also, another variation of CLIR usage was when a user chose to enter the Chinese word for smartphones- with no limitations by language- Google detects the language of the keywords and returns results in the same language (and sometimes performing a CLIR search and returning documents in other languages as well). In other cases, CLIR search results varied by the language pairs used. Variations within the same language were also present due to other factors such as choice of keywords or other limiting factors that were applied such as date country etc. Figures 4.4, 4.5, 4.6, & 4. 7 show variations of how MLIA tools were used in each of the tasks.

Figure 4.4a: CLIR search- Keywords entered in English and search limited to Spanish
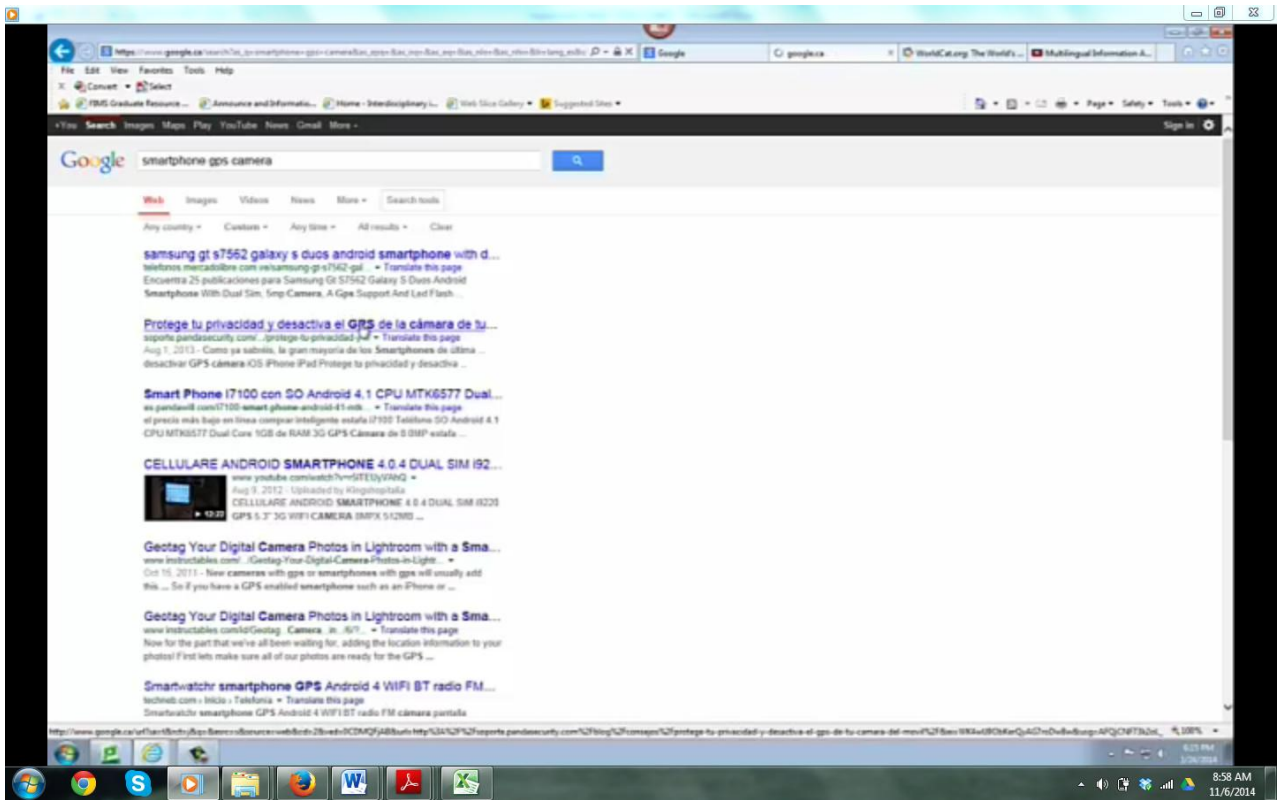
Figure 4.4b: CLIR Search: Keywords in English with search limited to Chinese.
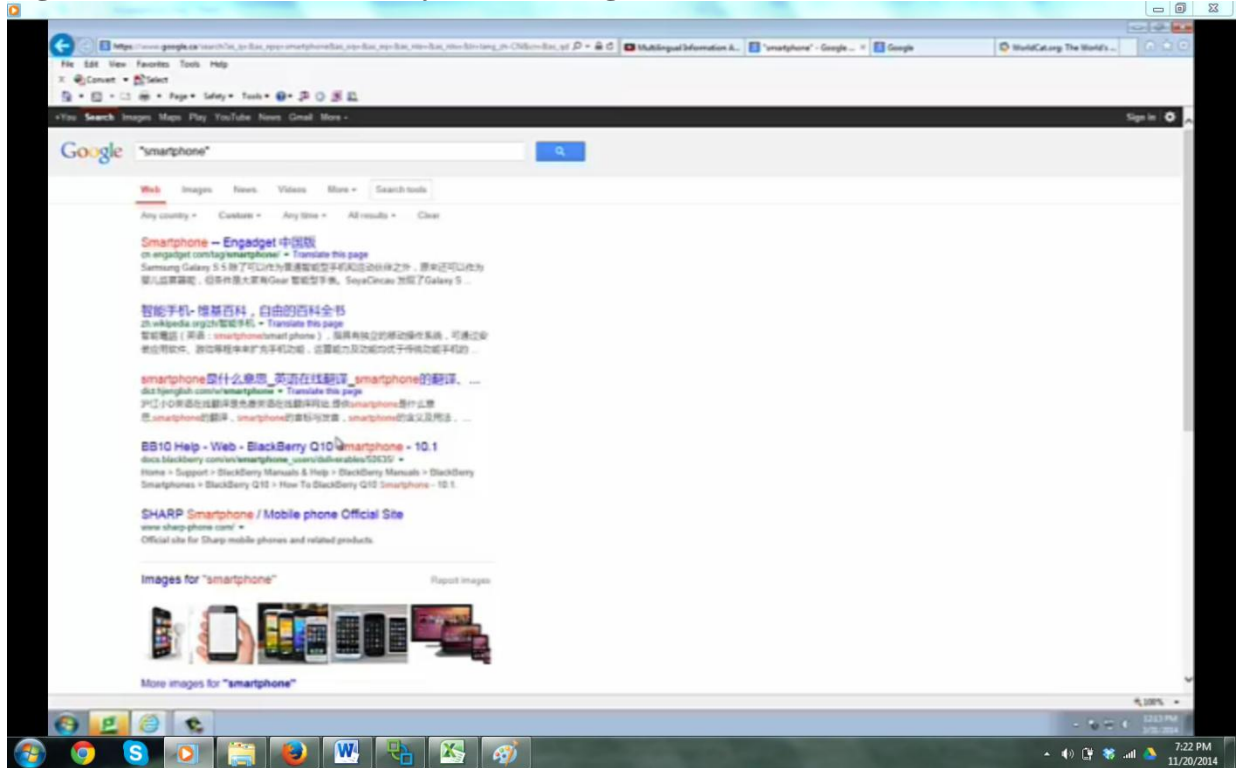
The screen shots Figure 4.4a and 4.4b illustrate usage of CLIR and Limit by language

tools on the smartphone task, with the variations in the languages used.

Figure 4.5a. Laptop Search using non-English search Engine (Baidu)

Figure 4.5b: MLIR search on Laptop: Keywords entered in Chinese in Google

Figures 4.5a and 4.5b illustrate usage of Chinese search Engine (Baidu), and a MLIR

search on Google for the Laptop task. In 5b Google automatically detects the search

language. This example also illustrates the variation in the results even though the same

language is used**.**

Figure 4.6a. CLIR Search on Global Warming: Keywords entered in English and search limited to Spanish
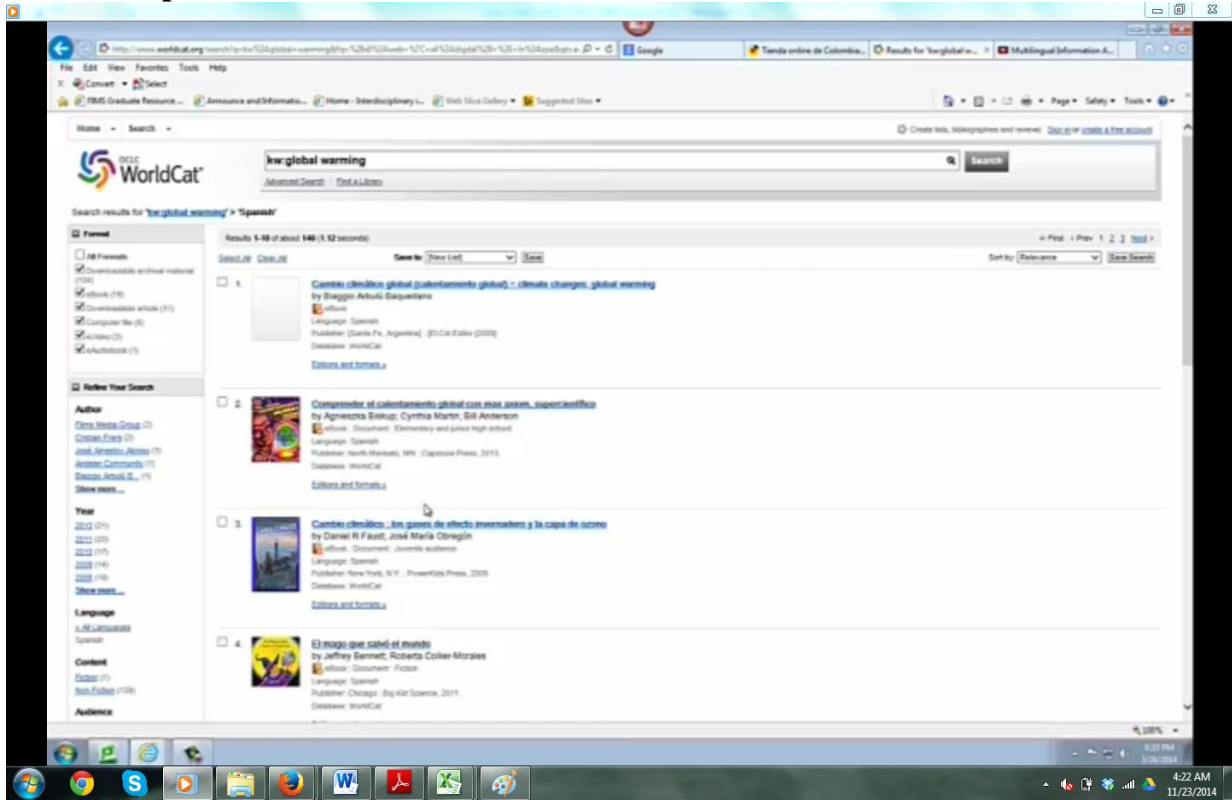
Figure 4.6b. CLIR Search on Global Warming: Keywords entered in English and search limited to Chinese
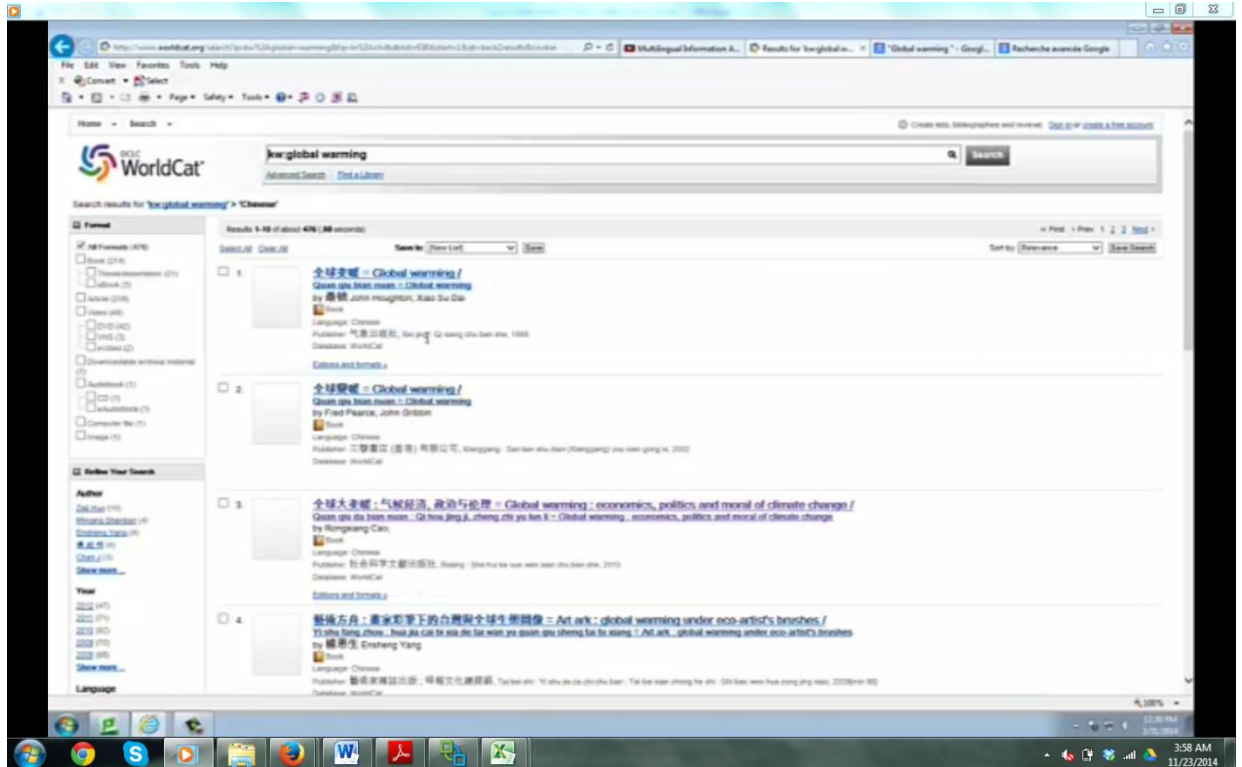
In the screen shots shown in Figures 4.6a and 4.6b, the CLIR search and limit by language tools are used for the global warming task, with the variation in the languages used- Spanish and Chinese.

Figure 4.7a. MLIR Search on Wetlands: Keywords entered in French
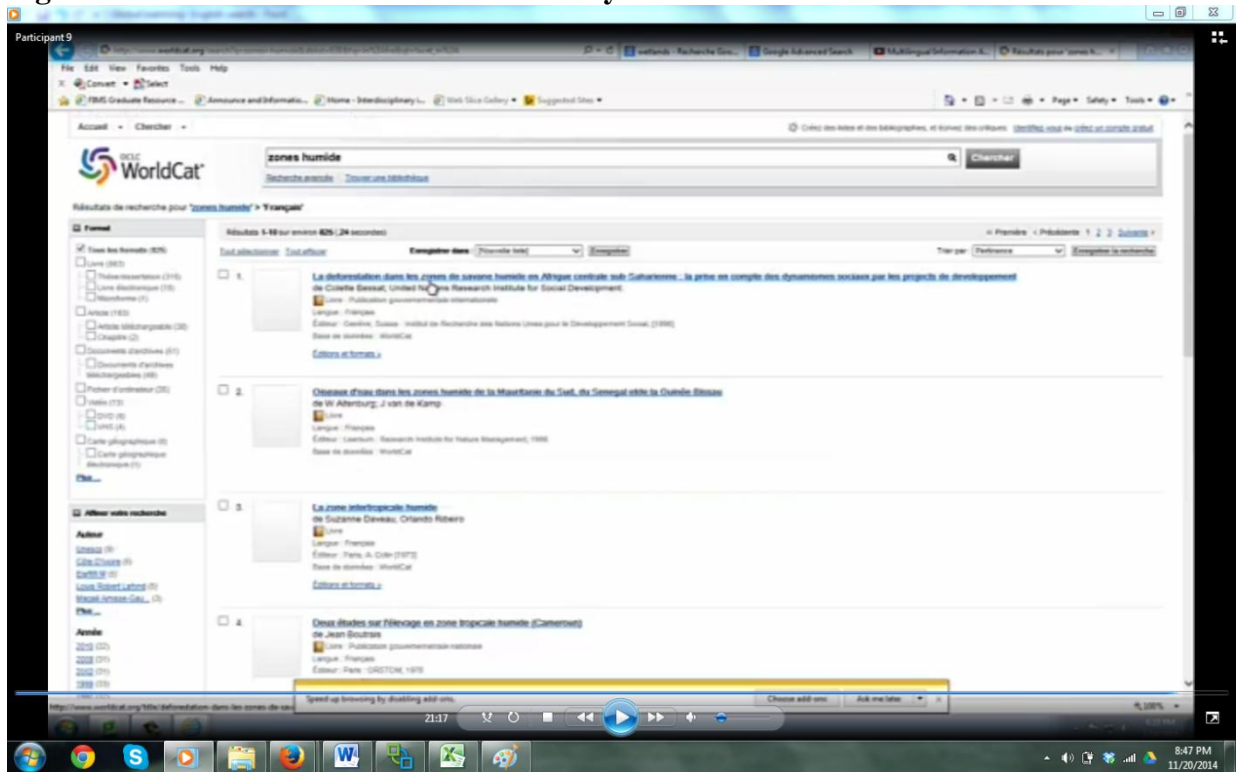
Figure 4.7b. MLIR Search on Wetlands: Keywords entered in German
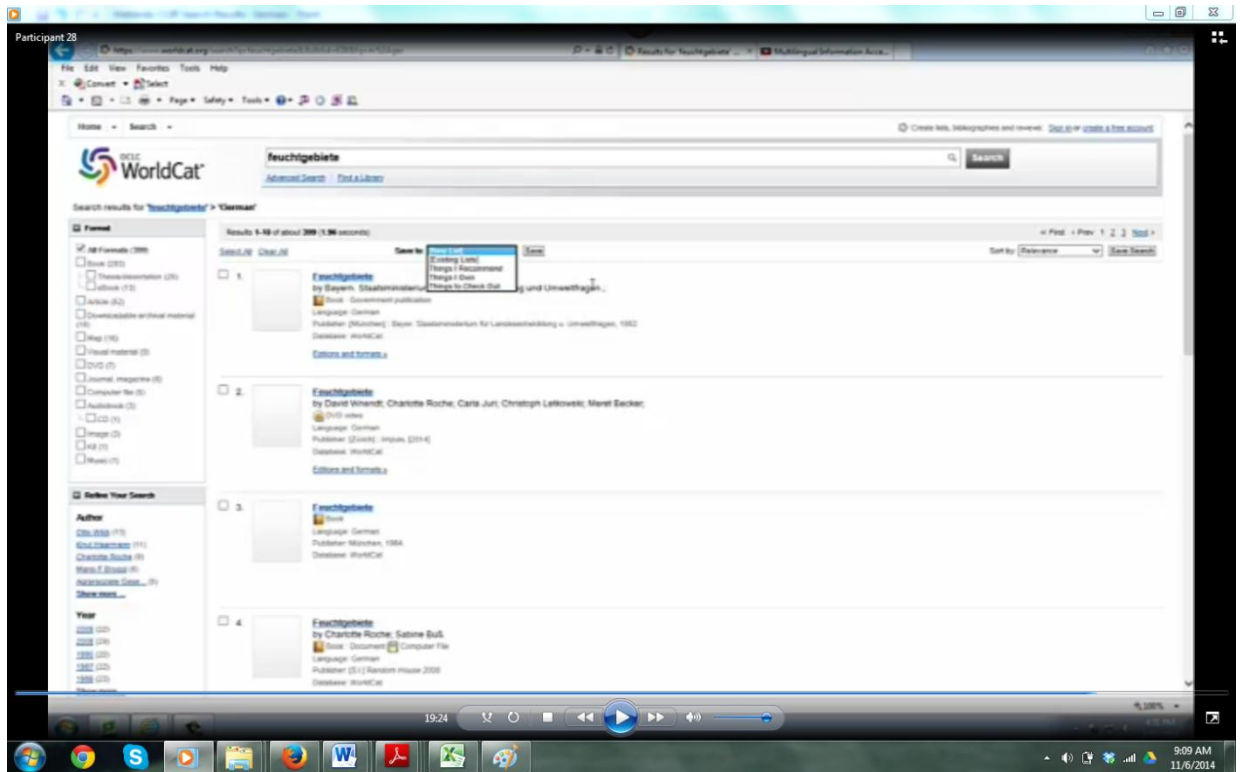
Screen shots in 4.7a and 4.7b illustrate usage of MLIR search in French and German on

the wetlands task. In 4.7a, the multilingual interface tool is used as well.

Tables 4.3a-d show descriptive statistics in regard to the number of MLIA tools used and the time spent on each of the tasks. Participants seemed to spend the most time on the Smartphone task, average time spent was 7 minutes 57 seconds, while MLIA tools were used most on the Laptop task.

Tables 4.3a-d: Descriptive statistics of number of MLIA tools used and time spent per participant for each task

Table 4.3a: Task 1A: Smartphone

	No. MLIA Tools Used	Time Spent
Mean	.87	7min 57s
Minimum	0	2min 20s
Maximum	4	17min
Standard Deviation	1.408	3 min 43s
Median	0	7 min 20s

Table 4.3b: Task 2A: Laptop

	No. MLIA Tools Used	Time Spent
Mean	2.17	5min 01s
Minimum	0	2 min 01s
Maximum	5	10min 06s
Standard Deviation	1.31	2min 10s
Median	2.0	4min 30s

Table 4.3c: Task 1B: Global Warming

	No. MLIA Tools Used	Time Spent
Mean	.70	5min 38s
Minimum	0	1min 24s
Maximum	4	13min 03s
Standard Deviation	1.29	2min 52s
Median	0	5min 33s

Table 3d: Task 2B: Wetlands

	No. MLIA Tools Used	Time Spent
Mean	2.07	5min 48s
Minimum	0	2min 0s
Maximum	6	13min 7s
Standard Deviation	1.79	2min 40s
Median	2.0	5min 19s

Source: Author's data from experiment captures

Figures 4.8a-d below show the number of participants using each of the MLIA tools by task. While for each task the three most popular tools were cross-language search, limit by language and MLIR, less than one third of the participants used each of these tools for the smartphone and global warming tasks (language used in stating both these tasks was English). As mentioned earlier participants used MLIA tools most on the laptop task followed by the wetlands task. Both of these were tasks where the language used in stating the task was native language. On these tasks, at least 50% of the participants used the limit by language and MLIR tools, and about one third used the cross-language search tool. These results therefore corroborate the finding on the relationship between language the task was stated in and the use of MLIA tools as revealed by the chi squares below. Possible explanations for this finding are also given in the section on chi squares.

Figure 4.8a: MLIA tool use on the smartphone task
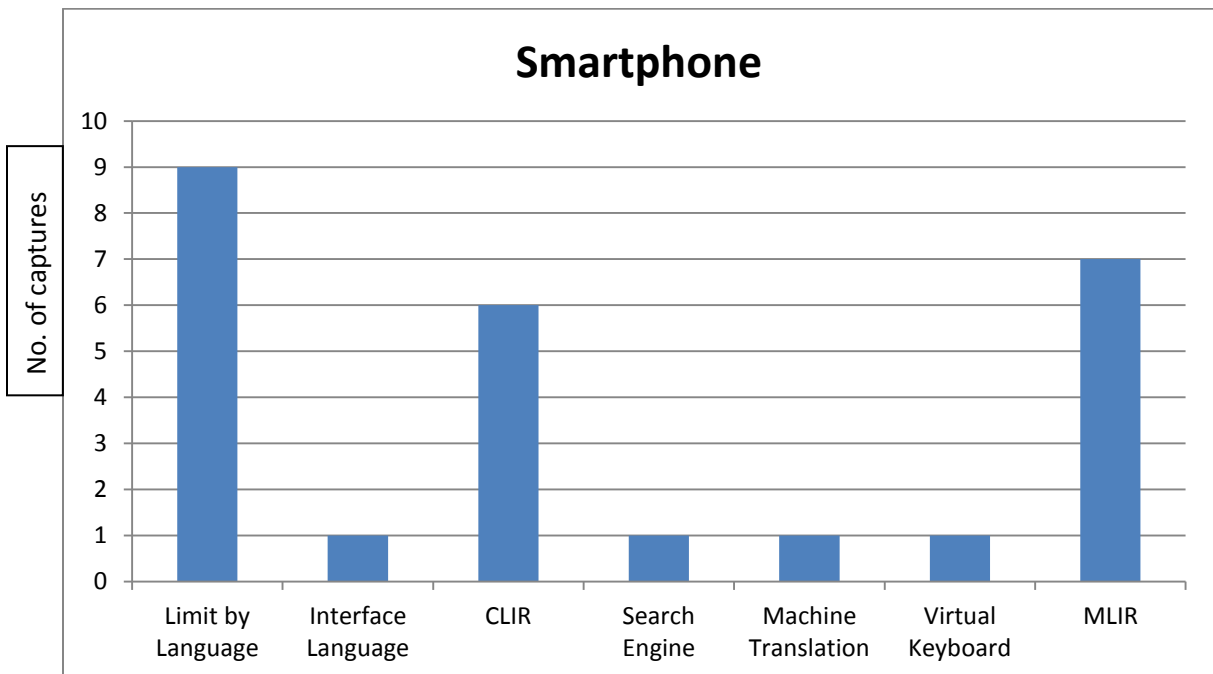
Figure 4.8b: MLIA tool use on the global warming task

Global Warming

No. of captures (y-axis: 0 to 7)

Limit by Language	Interface Language	CLIR	Search Engine	Machine Translation	Virtual Keyboard	MLIR
5	2	5	0	2	0	6
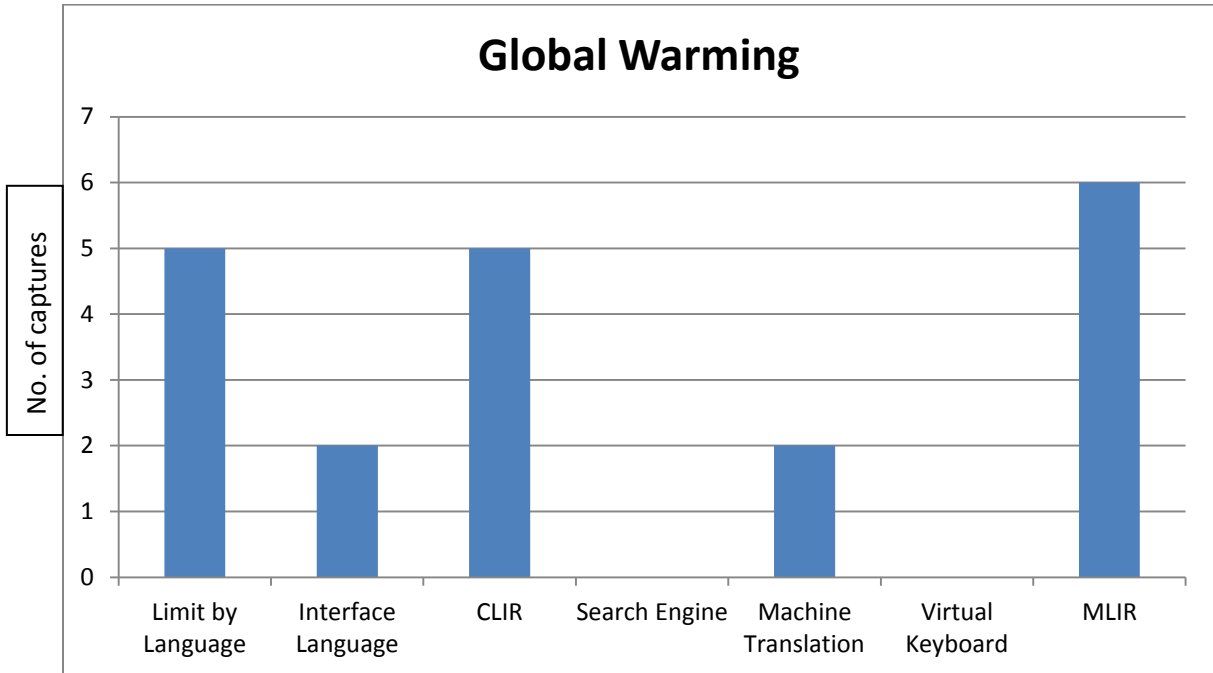
Figure 4.8c: MLIA tool use on the Laptop task

Laptop

No. of captures (y-axis: 0 to 25)

Limit by Language	Interface Language	CLIR	Search Engine	Machine Translation	Virtual Keyboard	MLIR
17	3	10	4	5	2	23
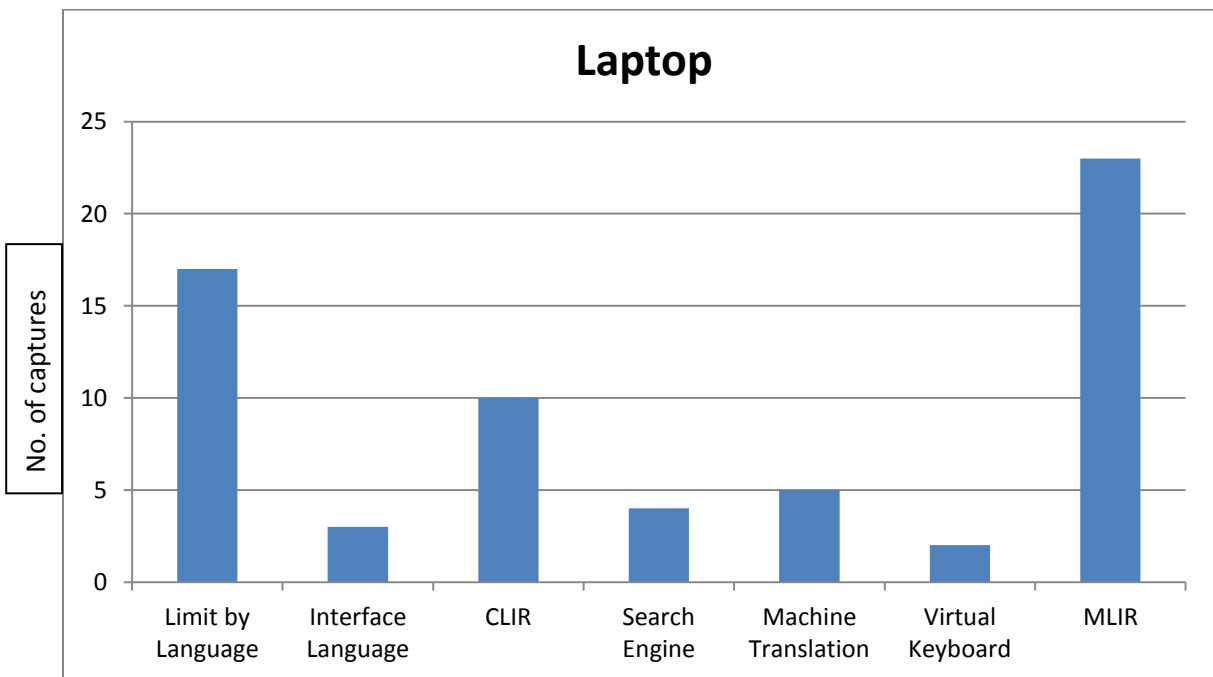
Figure 4.8d: MLIA tool use on the wetlands task
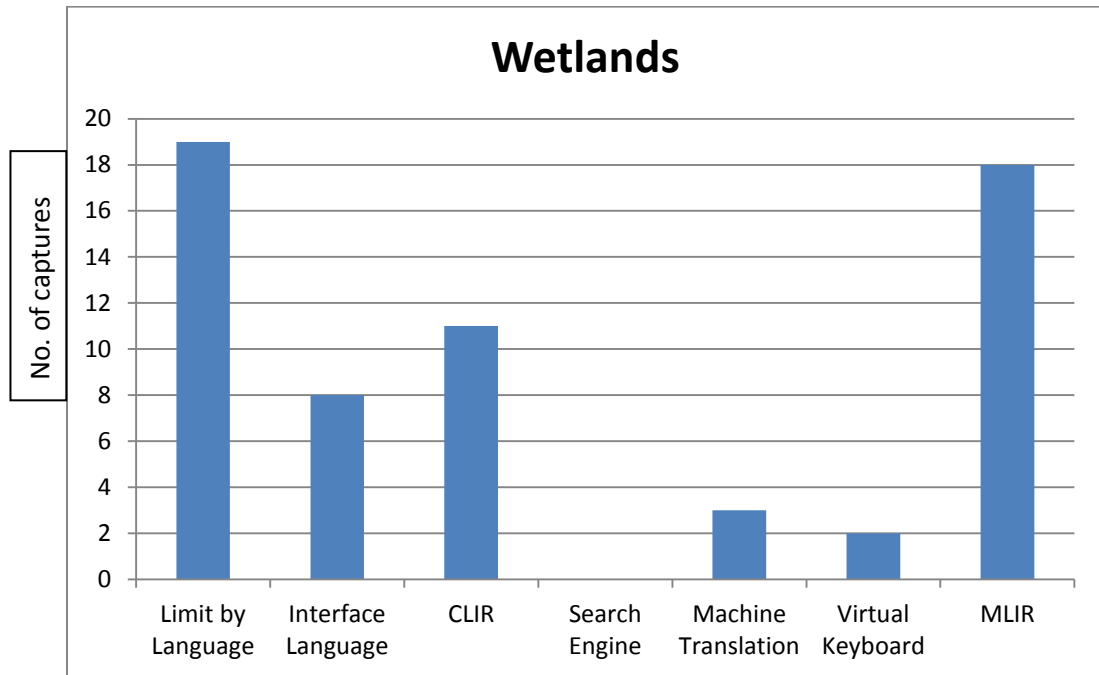
More relationships between variables were tested and the data from the captures further analyzed using SPSS with the following results:

Significant Relationships:

- There was a significant relationship between use of MLIA tools and the language task was stated in. *(x^2 (1, N = 120) = 24.762, p<. 001.):* The contingency table in Table 4.4 below shows that participants were more likely to use MLIA tools when the language in which the task was stated was their native language. It is unclear why this would be the case, though a possible explanation could be that the participants *assumed* that they were supposed to use MLIA tools for the questions where the query was given in their native language. Another possible explanation could be that students did not know the English keywords to use in their search

when the task was stated in their native language. Other studies (e.g. Johnston, Partridge & Hughes, 2014) have shown that EFL (English as a Foreign Language) students had a preference for translating from English to their native language but experienced many barriers when they had to translate information from their own language to English.

Table 4.4: Cross-tabulation of MLIA tool use by language task was stated in

MLIA Tool USE			Language task was stated in		Total
			English	Native Language	
No		Count	34	8	42
		Expected Count	21.0	21.0	42.0
	Yes	Count	26	52	78
		Expected Count	39.0	39.0	78.0
Total		Count	60	60	120
		Expected Count	60.0	60.0	120.0

x^2 *(1, N = 120) = 24.762, p<. 001*

- There was a significant relationship between use of MLIA tools and the search language (x^2 *(1, N = 120) = 25.006, p<. 001.*): As shown in Table 4.5 below, students were more likely to use MLIA tools when they used both English and their native languages to conduct their search, than when they used *English only*.

Table 4.5: Cross-tabulation of MLIA tool use by search language

			Search Language		
MLIA Tool USE			English	Both	Total
No		Count	38	4	42
		Expected Count	25.2	16.8	42.0
Yes		Count	34	44	78
		Expected Count	46.8	31.2	78.0
Total		Count	72	48	120
		Expected Count	72.0	48.0	120.0

(x^2 (1, N = 120) = 25.006, p<. 001.)

- An independent-samples t-test was conducted to compare time spent on each task when MLIA tools were used and when MLIA tools were NOT used. There was a significant difference in the time spent for when MLIA tools were used (M=5.7, SD=2.9) and when MLIA tools were NOT used (M=6.9, SD=3.3); t (118)=2.16, p = 0.033. These results suggest that students spent *less* time on the task when they used MLIA tools. Possible explanations for this time difference point towards ways in which using MLIA tools could save time e.g. changing the language interface could help them know how/where to enter their terms and how to apply additional limitations; using CLIR searches could save time otherwise spent on trying to translate the terms before entering them in and finally, using MLIA tools could help them understand and interpret the results retrieved better and faster.

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Non-significant Relationships:

- There was no significant relationship between MLIA tool use and system (i.e. Google vs WorldCat): *(x^2 (2, N = 120) = 2.651, p= .266).* Students were just as likely to use MLIA tools on Google as they were while searching on WorldCat. The implication drawn from this finding is that academic users need or use MLIA tools while searching on electronic databases just as much as they would need them when searching on the internet. Including MLIA tools in scholarly databases would therefore be beneficial to them.

- There was no significant relationship between the use of MLIA tools and type of task (i.e. Shopping vs academic task): *(x^2(1, N = 120) = 1.319, p= .251).* The implication here is that participants need MLIA tools for academic tasks (done on WorldCat) just as much as they need them for shopping tasks (done on Google). Practical implications for this finding are further addressed in the discussion section. This finding also mirrors the lack of consensus from the reasons given on the preference question on the post experiment questionnaire where some students indicated they would prefer to use MLIA tools for academic tasks while some others indicated they would only use them for non-academic tasks.

- There was no significant relationship between search language and type of task i.e. shopping vs academic. *(x^2 (2, N = 120) = 0.589, p= .745).* These results therefore did not corroborate some studies that found that user choice of search language was dependent upon types of search task, rather than familiarity with the language. Petrelli et al. (2004), for instance, reported that users chose the most appropriate language for their task, one that was not necessarily their native

language. Rieh and Rieh (2005) also found that for academic tasks, the participants in their study most often entered queries in English (second language), rather than in Korean (first language). They further posited that the reasons for the choice of language appeared to be predicated on two reasons: 1) The participants "believed that English queries would enable them to specify scholarly terms accurately"; and 2) "They intended to obtain English documents because they believed that documents published in English were more current, better, novel, and more credible than those published in Korean." (p. 251). A possible reason for this divergence could be that in this study users were not required to choose either one or the other (English vs. Native Language); but could choose to use both. Moreover, the main focus was to find out if they would choose MLIA tools or not- most chose to use MLIA tools and therefore tended to use both languages rather than choosing one.

4.5.2 Findings from the Post experiment questionnaire

The participants were asked to rate their satisfaction with the results they got from each of the 4 searches on a 1-5 Likert scale, with 1 representing not satisfied at all and 5 indicating very satisfied. The median satisfaction on all the four tasks was 4. In general, it would seem that the participants showed the most satisfaction with the Smartphone task. See frequency distributions in Figures 4.9, 4.10a and 4.10b below.

Figure 4.9: Satisfaction scores by task
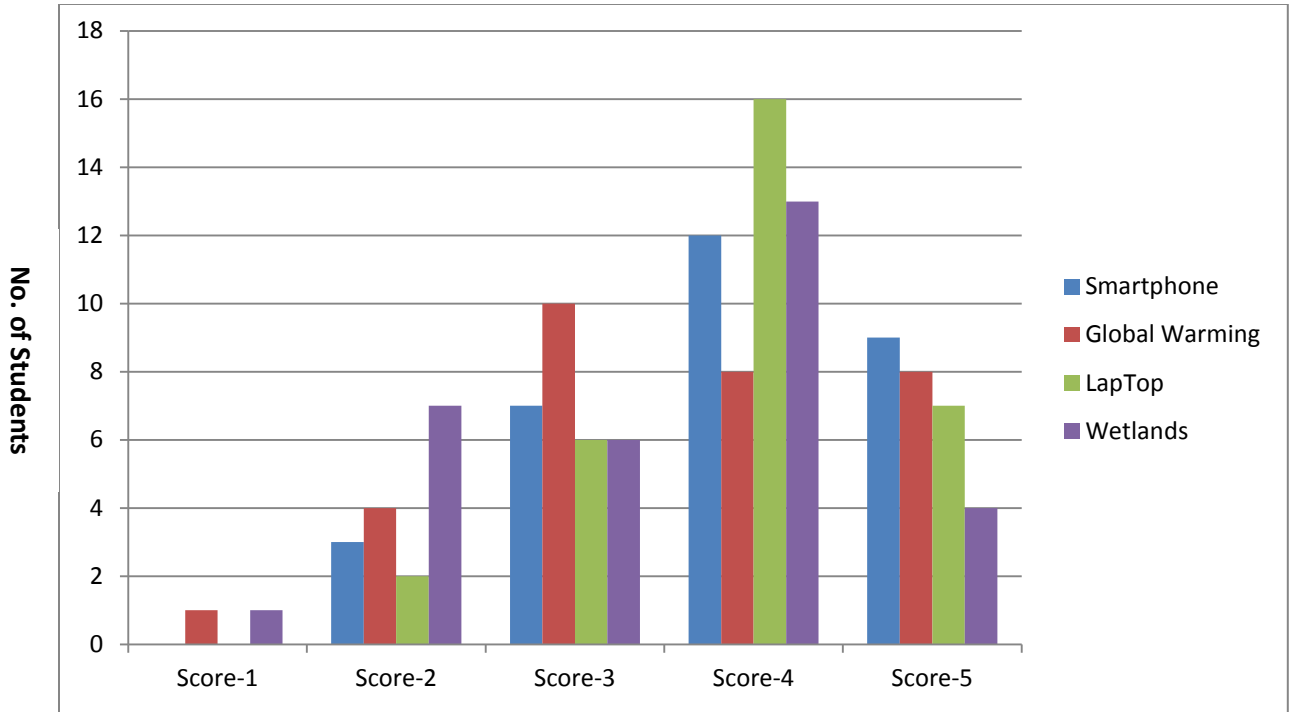
Figure 4.10a. Satisfaction scores by type of task- shopping task vs. academic task
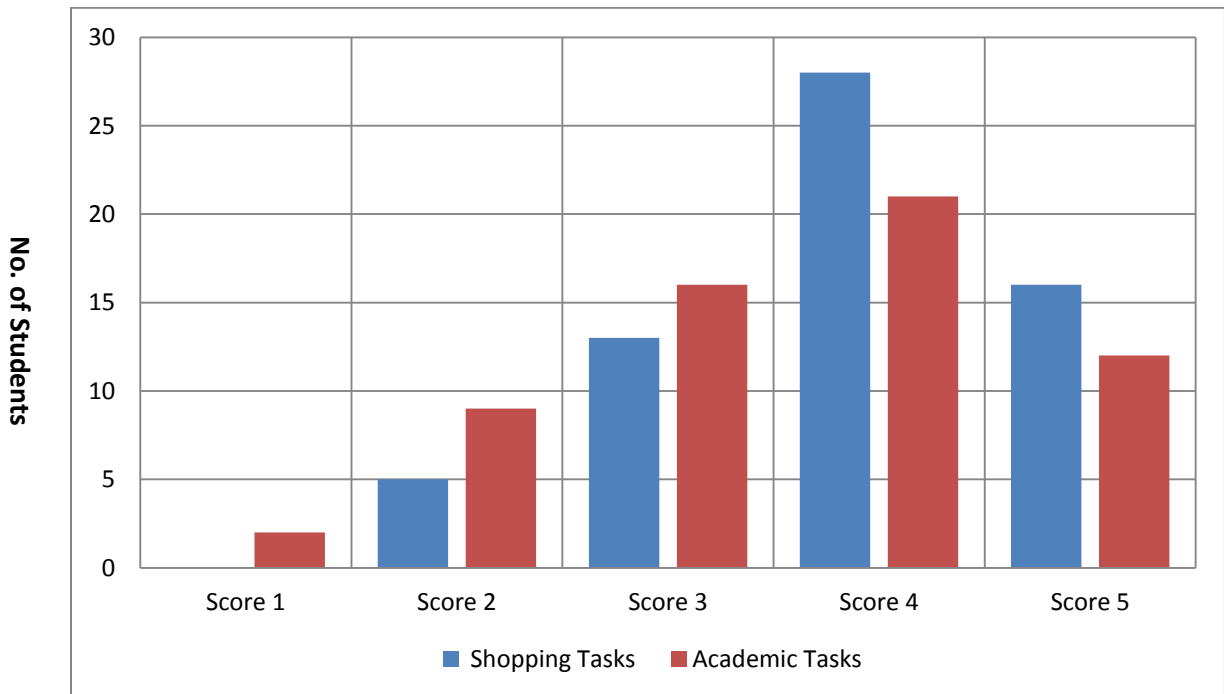
Figure 4.10b: Satisfaction scores by language task was stated in – English vs. Native language
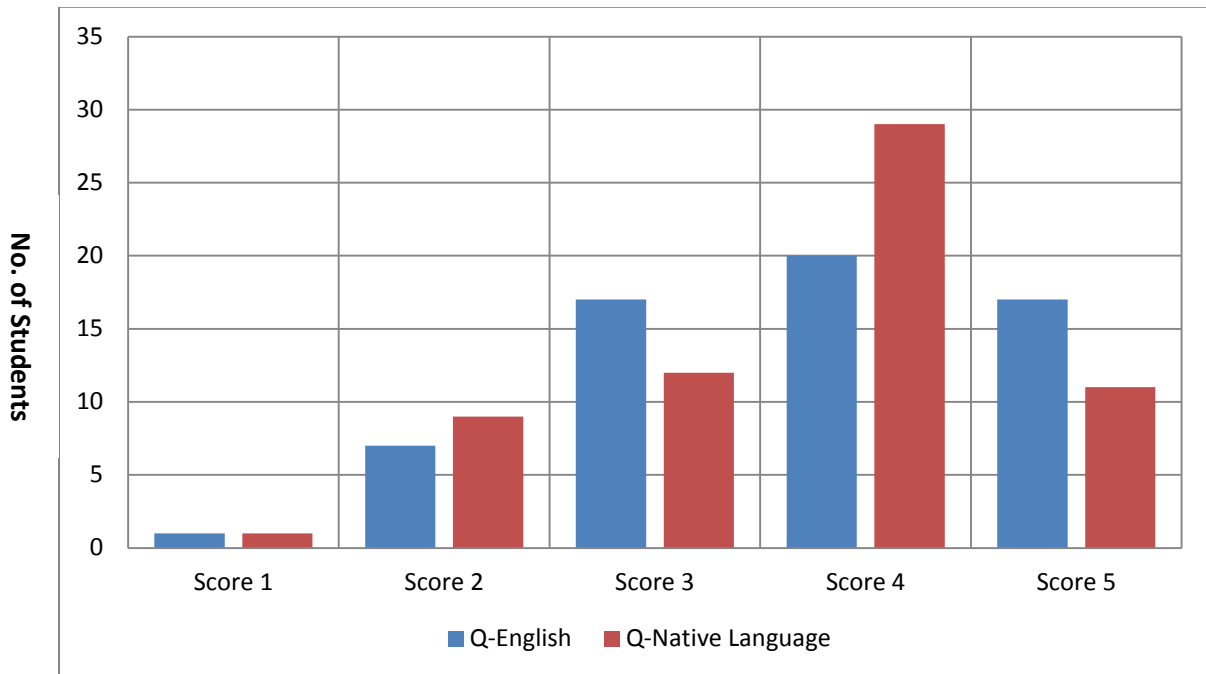
Source: Author's Post- experiment questionnaire data

Chi square tests were done to test if there was a significant relationship between satisfaction scores and the language the task was stated in; on the shopping tasks, no relationship was found: (x^2 (2, N = 62) = 1.044, p= .593). Similarly on the academic tasks, no significant relationship was found between satisfaction scores and the language the task was stated in (x^2 (3, N = 62) = 4.216, p= .239. It would seem therefore that the language the task was stated in did not have a significant effect on the satisfaction of the students with their search results.

The participants were asked what MLIA tools they had used in the past and which MLIA tools they intended to use in the future. Figure 4.11 shows a comparison of the two.

Figure 4.11: MLIA Tools- Past & Future Use comparison
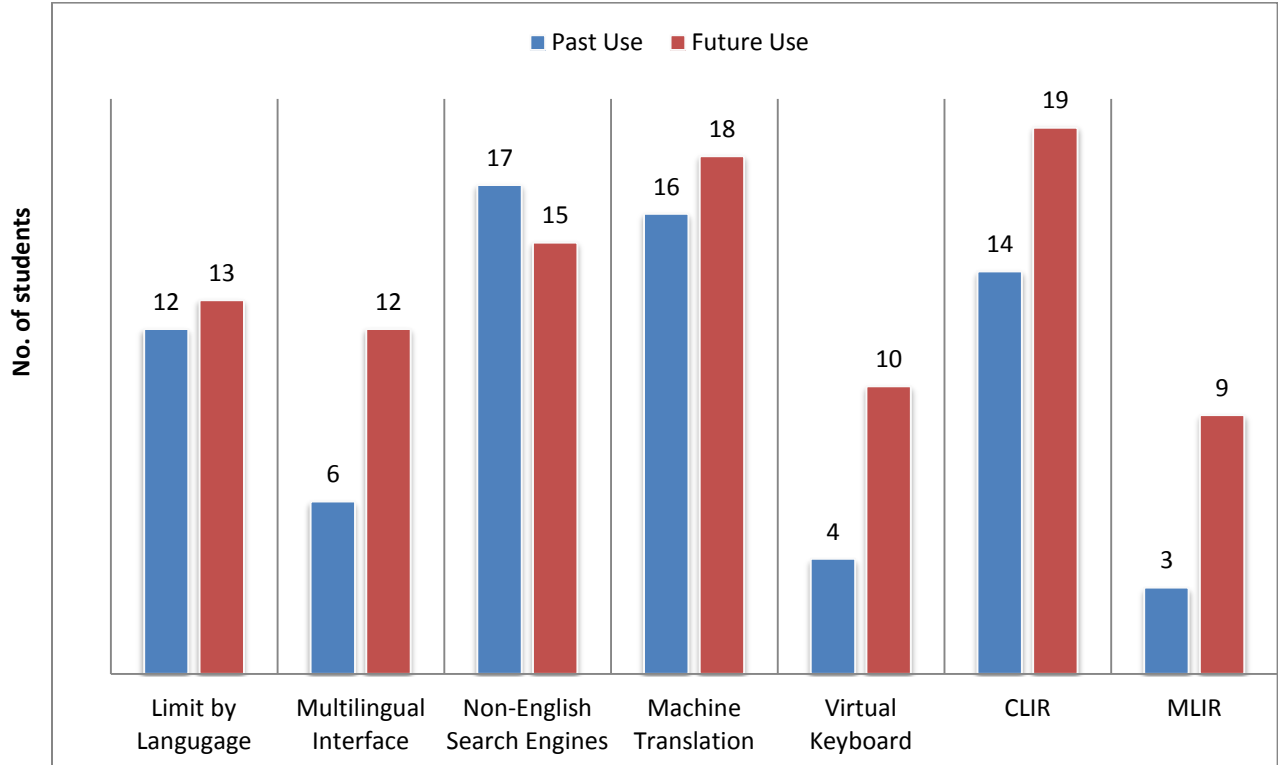
Source: Author's post experiment questionnaire data

 Non- English Search Engines was the tool that the highest number of participants (17) indicated they had used in the past, followed closely with machine translation (16). Reasons for this could be that these were tools they were already aware of, whereas they lacked awareness of some of the other tools. The new tools they were introduced to in general, showed an increase in future use, while non-English search Engines saw a slight drop for future use- from 17 past use to 15 future use; CLIR saw an increase from 14 to 19; others with an increase include multilingual interface (from 6 past use to 12 future use); virtual keyboard (from 4 past use to 10 future use). In the "other comments" section for the post experiment questionnaire, one of the participants wrote:

> *"The cross-language search was particularly interesting. I didn't even know the existence of such a function."*

While another commented:

"...Since Google company has exited in the market in China, there

*might be less information in Chinese compared with some **Chinese***

***search Engines**. Thus I would like to use another country specific*

search engines when looking for information in specific language."

These comments would seem to support the finding that students were already aware of, and used some of the MLIA tools such as Non-English search Engines, but were unaware of others such as CLIR. When asked at what stage in the information searching process they felt they needed MLIA tools the most, 23.3% said they needed them most at the query formulation stage , 33.3% chose "Reading the Information retrieved", while 43.3% chose "Assessing the relevance of the results".

Figure 4.12: IR Stages and when MLIA tools were needed most
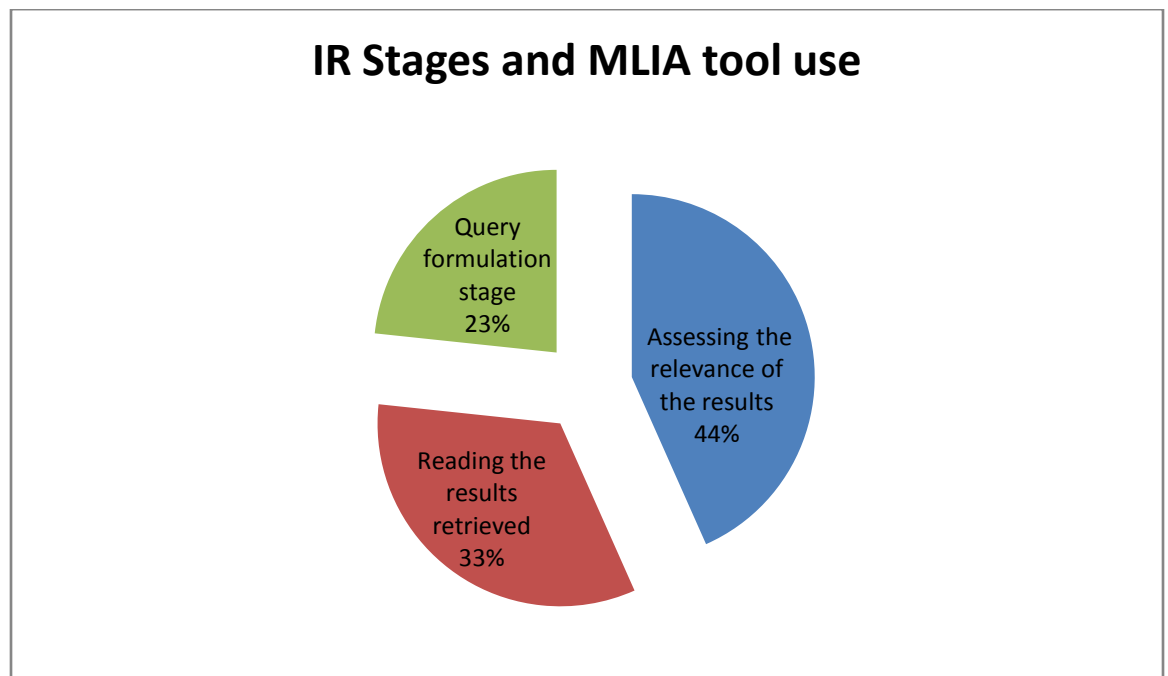
Source: Author's post experiment Questionnaire data

Students were asked to indicate whether they prefer to use MLIA tools or not, or whether they had no preference at all. The results are represented in the pie chart in Figure 4.13, with 60% indicating that they preferred a search using MLIA tools, 30% had no preference at all, and 10% chose a search *without* MLIA tools. Students were then asked to explain their choice or give reasons for their choice, not all the participants gave a reason for their choice. Reasons given for their choices are consolidated and summarized in Tables 4.6, 4.7 and 4.8.

Figure 4.13: Preference for use/non-use of MLIA Tools
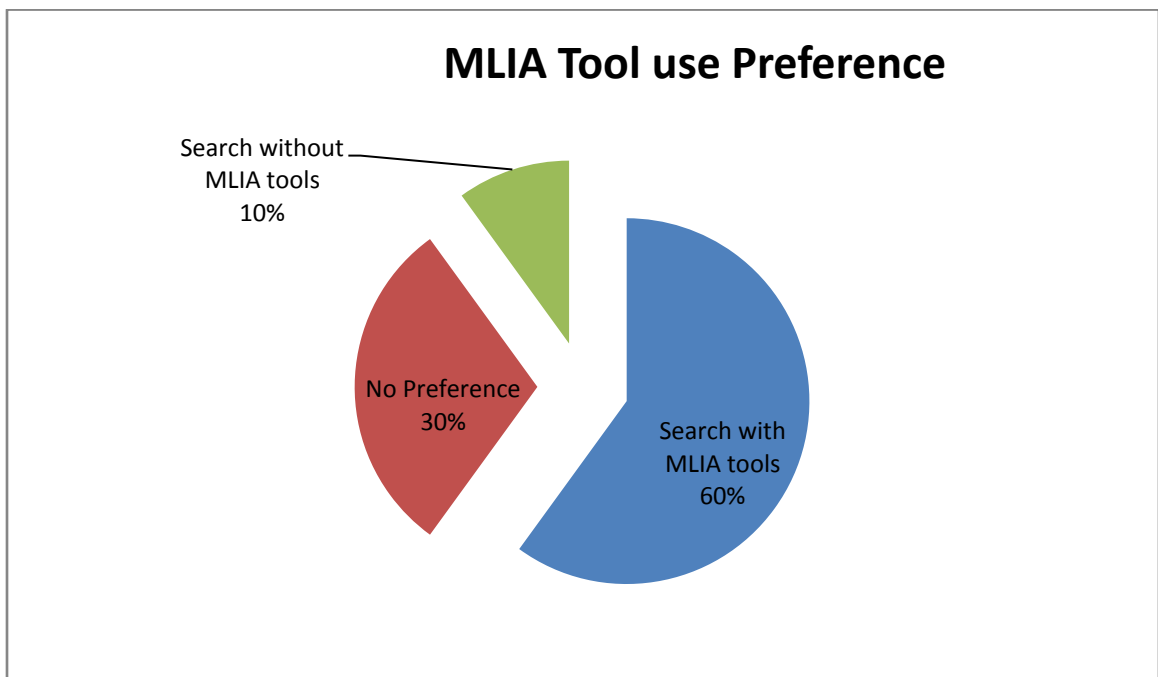
Source: Author's post -experiment questionnaire data

Table 4.6: Reasons for preferring a search without MLIA tools

I have no obstacles in reading English.
Chinese resources sometimes violet *(violate)*[*] IP law and professors may not trust resources from other languages
I can fairly understand English.

Italics-author's addition

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Table 4.7: Reasons for preferring a search WITH MLIA tools

Stage	Reason
Query Formulation Stage	You will get specific information you need based on the certain language you want so that you spend less time on selecting.
	It increases my searching speed, so I spend less time on the searching process.
	It helps to find more precisely the specific result I am looking for.
	With MLIA tools I can narrow my search by language, country and so on. It saves my time and the results are likely more specific.
	Since sometimes we do not know how to translate the keyword to English or other languages, the computers can help us.
	It can narrow my searching area and it is easier to find a suitable answer
	Because they help restrict your search.
	Because they help me limit my search to only my language.
Assessing the Relevance of the results	When I search with Chinese, I can easily understand some certain terms; especially when I was searching for smartphone and laptop.
	It helps me narrow down the results to most relevant and it's easy to compare multiple results.
	It is very helpful to be able to retrieve information in specific and several languages when another one is not sufficient.
	I would like to use MLIA tools while doing some academic research. It helps me focus on more information that I need to use in one specific language, but for most daily research, this tool seems limited for the information
	It saves my time and the results are likely more specific.
Reading the Results I retrieve	It can help us find information about (in) our mother language even the computer doesn't have that language program. We can also make a comparison
	If I need to search something I don't familiar with or I don't know its language, it will be very important I can read the search results in my own language. I read faster and understand better in my own language
Unclassified (no specific stage)	They're more convenient and useful
	Save more time
	It is easier to find the information I want even though I need more time to adjust to MLIA tools.
	It makes searching for information easier and it can translate different

	languages automatically.
	They can assist to do the search more efficiently.
	It is always better to have more tools than less in case there's a need for them. Here, the tasks were simple, the vocabulary was simple, no need for them
	It is an easy way to get what I want quickly.
	It helps me gain the technique of searching online
	It is always best to have all the options just in case even if I do not find them particularly useful myself

Table 4.8: Reasons for having *No Preference*

Doesn't help much.
For scholar search I prefer not to use MLIA because it cannot find something relevant to what I want.
Actually unless I have to search for information academically, I won't use this tool for the reason that it is not that efficient and accurate.
It does not make much of a difference. I have been in Canada long enough to handle English as well as Chinese.
Not so much for me, however for some non-native speakers *[of English]*, translation tools are really needed.
I would have definitely said yes a couple of years ago but I feel now so comfortable with English that I don't mind searching/ reading in English and MLIA tools are then quite time consuming.
It depends on the situation. If I need to finish my homework in English, I will use MLIA tools. However if I just need some information, I prefer to use Chinese.
I could use either. I'd care more about the *[relevance of the]* results I get.

Author's addition in Italics

Looking at the reasons mentioned above it is interesting to note that while some thought

that MLIA tools made their search faster and more efficient, thus saving time, while some

others thought using them was time consuming. Statistical tests from the experiment

captures were more conclusive, showing a significant difference between the average

times spent using MLIA tools and the average time spent doing a search without MLIA

tools. The results also indicated that students spent more time on the task when they did

NOT use MLIA tools. Though there could be possible explanations here such as the

students being able to understand or being able to interpret results faster and better when

they used MLIA tools, these would be speculative as other factors such as task, domain knowledge and language proficiency were not controlled for by the researcher. Results from the post experiment questionnaire were mixed, showing a lack of consensus on the reasons given on the preference question with some indicating that they preferred to use MLIA tools because it saves time while others indicating they preferred NOT to use MLIA tools as this was time consuming.

Participants who selected preference for a search with MLIA tools indicated that the tools were most useful at the query formulation stage and in assessing the relevance of the results. It is also implied by those who had no preference or those who would choose not to use MLIA tools that their comfort level or language proficiency in English precludes them from the need to use MLIA tools. The type of task at hand also seems to be a determining factor on whether to use MLIA tools or not, although as can be seen in the comments below, there was no consensus on this, with some participants mentioning that they would use them primarily for academic tasks (which in this case would be given and have to be completed in English), while others mentioned they would not use them for academic tasks:

> "*For scholar search I prefer not to use MLIA because it cannot find something relevant to what I want.*"   *Vs*

> "*Actually unless I have to search for information academically, I won't use this tool for the reason that it is not that efficient and accurate.*

Relationships between variables on the Post –Experiment Questionnaire

Chi square tests were done to determine the relationships between various variables on the post experiment questionnaire with the following results:

- No relationship was found between participants' perceived ease of using MLIA tools and preference in regard to using them: (x^2 (6, N = 30) = 9.545, p= .145).
- No relationship was found between participants' perceived usefulness of using MLIA tools and preference in regard to using them: (x^2 (8, N = 30) = 8.417, p= .394).

The above results would seem to imply that participants' preference or non-preference for using MLIA tools was *not* related to their perceived ease of use or perceived usefulness. The reasons they gave were much more related to language proficiency. For instance, those who indicated no preference gave reasons such as *"I'm comfortable searching in English as well as my native language"*.

The participants were also asked to rate, on a scale of 1-5 how useful MLIA tools were to them in their search (with 1 representing Not very useful at all and 5 representing Very useful). They were also asked to rate on a scale of 1-5 how easy it was to use MLIA tools (with 1 representing Not easy at all and 5 representing very easy.The median for usefulness of MLIA Tools was 3.5 while the median for ease of use was at 4. The results from these two questions are represented in detail in Tables 4.9 and 4.10 below.

Table 4.9: Usefulness of MLIA Tools

Scale Rating	Frequency	Percent
1 (Not Useful at all)	1	3.2%
2	4	12.9%
3	10	32.3%
4	12	38.7%
5 (Very Useful)	3	9.7%

Median= 3.5

Table 4.10: Ease of Use of MLIA Tools

Scale Rating	Frequency	Percent
1(Not easy at all)	0	0%
2	3	9.7%
3	4	12.9%
4	11	35.5%
5 (Very easy)	12	38.7%

Median=4

Even though median scores for usefulness and ease of use seem to be on the higher side, findings and analyses from other results in the study would seem to indicate that other factors such as language proficiency and/or choices made in regard to search language also played a significant role in whether or not a participant would find it easy to use MLIA tools and whether or not they would find them useful. As was noted in the sections on relationships between variables, perceived usefulness and perceived ease of use were *not* a good predictor for preference in using MLIA tools. Instead, perceived English proficiency seemed to be the reason mentioned most frequently by the participants for preferring to use or not use MLIA tools. Where usefulness was mentioned as a reason for preference to use MLIA tools or not, there was no consensus with some participants commenting that depending on the type of task, MLIA tools would be useful and others commenting that they would not be useful at all.

4.6 Discussion

The study found no consistent patterns in the information searching behavior of this user group. Perhaps this may be because as far as bi/multilingual users are concerned, they are not by far a homogeneous group: The diversity exists not just in terms of their different linguistic backgrounds, but also because even within the same language- proficiency levels vary. Terms like elementary, intermediate, advanced, near native fluency, fluent, limited proficiency, full proficiency, mother- tongue, native language, first language (L1), second language (L2) are used to describe levels of proficiency. Furthermore, with regard to language skills, individuals can have a range of both passive (e.g. comprehension, reading) and active (production- verbal, writing) abilities based on their mother tongue and other languages they may have studied for any length of time. Observations of the interactions of the users with the systems in the current study as well as their perceptions of these interactions have reiterated the differences and diversity that exist in these interactions and perceptions. Other studies have also pointed out these differences in the context of multilingual information searching such as differences in interaction styles (Ruecker, Shiri & Fiorentino, 2012; Petrelli & Clough, 2012), as well as differences in the preferences by users on what role they play in the translation of terms during a CLIR search (Ogden & Davis, 2000; Petrelli & Clough, 2005; Artilles et al, 2006). Since several factors in particular language proficiency of the user impact their information searching behavior, it would seem that a model that takes into consideration specific characteristics of the user would be suitable in explaining the information searching behavior of bi/multilingual academic users. Personalized Multilingual Information Retrieval (PMLIR) models (e.g. Ghorab, Zhou, Steichen &Wade, 2011)

would therefore seem to hold great potential for best representing the bi/multilingual academic user's information searching behavior.

The results of the study would seem to reveal a high acceptance of MLIA tools, albeit also a lack of awareness of some of these tools, amongst bi/multilingual academic users. However, the use or non-use of these tools depends on many factors, primarily the linguistic background and language proficiency of the user. The diversity, variations in use and non-use, even for the same participant also highlight what other studies in information science have found: that information seeking and/ or searching is a complex process that is subject to many influences such as characteristics of the user and the contextual factors such as type of task, type of system and its functionalities. In a MLIR online environment factors such as language proficiency and domain knowledge of the user, availability of MLIA tools on the system, languages supported by the system play an important role both in the process of searching for information and using that information.

As mentioned in the results sections, participants used MLIA tools on the shopping tasks (done on Google) just as much as they did on the academic tasks (done on WorldCat). This finding has implications for IR system designers especially in regard to scholarly databases: the results imply that these tools could be useful for academic users and therefore more of these tools such as MLIR (or support for more languages), machine translation, CLIR search options would be desirable. Given that some of these databases access non-English collections, CLIR search options or support for multilingual queries would be useful. There's also need for these tools to be seamlessly integrated so they are easy to find and use, and not built on complicated advanced search protocols which are

not easily accessible especially for a novice searcher. It would also be helpful for the databases to mention in their help sections the extent of their coverage of multilingual materials. In regard to abstracting and indexing, providing multilingual thesauri and abstracts in more than one language would greatly enhance the user's understanding of the record's bibliographic information and in turn aid their ability to assess the relevance of the documents retrieved. Machine translation could also be made available to users to help in understanding the documents they retrieve. This should also be easily accessible and not require an administrator to enable it or for the user to exit the database in order to access a translation service which may sometimes be costly.

In the current study, various language issues were observed from the captures such as:

- Vocabulary issues: some of the users sought the definition of terms such as "dealer", "smartphone", "review", "global warming", "wetlands", and "scholarly" and even after finding out the meaning, sometimes the participant ended up using the terms in a way that affected their search results. For example one participant entered the terms "wetland scholar" on the task on wetlands, and did a CLIR search; this obviously had repercussions on their results.

- There were also spelling issues that came to light with users entering in misspelled words that led to no hits.

- The language the terms are entered in (search language) will almost always have an effect on the results retrieved. For example, if the limit by language tool is not applied, the system will detect the language used and rank the results by language rather than relevance, with the documents in the search language appearing on top of the list.

While it may be argued that the above named issues are in no way unique to a user

searching in a language they may not be proficient in, these may be exacerbated by a lack

of language skills, and the translation involved in a CLIR search. The study certainly

corroborates the findings of other studies that revealed that LEP (Limited English

Proficient) users faced a number of language related challenges while searching for

information online which included but were not limited to: keyword selection, using

plural forms, synonyms, and correct spellings (DiMartino, Ferns, & Swacker, 1995;

Hughes, 2005; Varga-Atkins & Ashcroft, 2004). However, judging from the use of

English in a good number of the captures from the experiment (English was exclusively

used in 72 (58.1%) searches), and from the remarks given by the participants on the post-

experiment questionnaire, it would seem that the participants in the study possess good to

very good English proficiency skills or at the least, they displayed a good comfort level

with using English while performing their searches. These findings corroborate the

results from the first phase of the study where the majority of the participants self-

reported their English proficiency levels as good to very good.

This study also highlighted the role that information literacy skills play when combined

with language skills i.e. that the use of MLIA tools needs to be accompanied with

appropriate information literacy skills. Examples of information literacy issues that were

observed from the captures include:

- Over- reliance on Google: participants tended to use Google even in situations

    where they had been instructed to use the other system i.e. WorldCat. In a survey

    that preceded this study with the same participants, when asked if they used

    electronic databases, one participant noted: "*When I don't find what I need in*

Google." This mirrors others studies that have alluded to students' affinity to turning to Google first for their research needs (Fast & Campbell, 2004).

- A chi-square test revealed no significant relationship between MLIA tool use and the system meaning that students were just as likely to use MLIA tools on Google as they were those on WorldCat. This finding shows that students' lack of use of MLIA tools on bibliographic databases and electronic databases may be due to a lack of awareness of the existence of these tools on the databases and not necessarily because these databases do not provide these tools.

- In general, students exhibited good to moderate information literacy skills e.g. using other limiting factors such as date, country.

- Students mainly used keyword and comparison strategies for the search: given the nature of the tasks, these were "appropriate" strategies that seemed to yield results that the students deemed adequate to fulfil their hypothesized information need. More naturalistic settings e.g. where students are engaging in an online shopping task may show use of other strategies e.g. directly accessing a preferred online store or website by entering the name of the store or the URL.

The stages in the IR process where MLIA tools are needed most depended on other factors such as language proficiency of the user, and type of task. In the first phase of the study involving a web survey, self-reported data revealed that the participants needed help the most at the query formulation stage. These results were however not confirmed in the current phase of the study. Other studies have also found varying results on this aspect. Hansen et al (2002) for instance found that the participants in their study needed help the most in assessing the relevance of the results retrieved. In another study

exploring which users would benefit from CLIR in web retrieval, Airio (2007), found that users with good to moderate/ passive target language skills would benefit most from CLIR at the query formulation stage i.e. query translation while those with poor target language skills could benefit from both query and document translation, i.e. both the query formulation stage as well as in reading the documents they retrieve.

The aforementioned observations and analyses of the experiment captures and post experiment questionnaire reiterate the fact that MLIA tools do not exist in a vacuum but do in fact exist in the broader context of Information Retrieval and Information literacy. This in turn underscores the role of IR system designers in ensuring they design systems that take into consideration users' search behavior and patterns and needs. It also underscores the role of LIS professionals in ensuring they equip their users with the necessary skills for searching for the information they need.

4.7 Conclusion and Future Research

This research attempts to look in depth into one case of bi/multilingual academic users' use of MLIA tools on Google and WorldCat. Despite this limitation, the discussed results bear implications for other bi/multilingual users worldwide. The findings of the study reveal diversity in the information searching behavior even for the same participant. Because of this variety, the study does not aim to generalize the findings or imply that the findings represent the majority of bi/multilingual academic users. This complexity and variety of the information searching behavior of users in an online MLIR context would seem to indicate that Personalized Multilingual Information Retrieval (PMLIR) models would be suitable models in representing the information searching behavior of this user group. The findings also reiterate the importance of user-modeling

and user-centered design in developing multilingual information retrieval systems. The study corroborated results from other studies that revealed that language choices while searching for information online can be affected by factors such as type of task (Petrelli, 2006; Rieh and Rieh, 2007), and domain knowledge (Clough & Eleta, 2010).

Moreover, judging from their reasons especially for having no preference at all or for not using MLIA tools, the study showed that in the North American academic context, MLIA tools *maybe* useful for users who have moderate to poor proficiency in English. For those who are fully proficient in English use of MLIA tools may be relevant when visiting a different country whose official language is not English; when they are doing non-academic related tasks, or when they want to communicate with individuals who do not speak English.

With advancements in NLP and improvements in existing technologies such as Machine Translation, many of the language barriers in the online environment could be alleviated, as is already the case. However, further research is needed in order to reach to some tangible and usable findings which will contribute to the design of efficient, effective and user-friendly MLIR systems. User-centered, longitudinal studies using multiple methods including log analyses could certainly help in user-modeling and in developing PMLIR systems.

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CHAPTER FIVE
Multilingual Information Literacy (MLIL):
Students' and Librarians' Perspectives

5.1 Introduction

There have been conscious, concerted efforts in recent times towards civic engagement and building societies where individuals are information literate. The Moscow Declaration on Media and Information Literacy of 2012 for instance, underscores the importance of building information literate societies: " In order to succeed in this environment, and to resolve problems effectively in every facet of life, individuals, communities and nations should obtain a critical set of competencies to be able to seek, critically evaluate and create new information and knowledge in different forms using existing tools, and share these through various channels."[2] (p. 1). Various challenges, including language barriers, stand in the way of achieving some of these objectives. In the online environment for instance, limited English proficient users are likely to face language barriers: statistics show that even though English has seen a decline in its dominance in terms of web pages offered in English, the percentage still stands at 55.7%, compared to the next language, German, at 6.1% (Web Technology Surveys, 2014).

Centered at the intersections of multilingualism and information literacy, the current study explores the information searching behavior of bi/multilingual academic users and examines language issues and how they impact information access and information literacy.

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[2] Retrieved from: http://www.ifla.org/publications/moscow-declaration-on-media-and-information-literacy

5.1.1 Multilingualism

 A definition of bilingualism or multilingualism has eluded researchers for a very long

time. According to the Linguistic Society of America website[3], some researchers have

favored a narrow definition of bilingualism and argued that only those individuals who

have near native proficiency in two languages should be considered bilingual, while

others have more recently argued for a broader definition that views bilingualism as a

common human condition that makes it possible for an individual to function, at some

level, in more than one language. This definition of bilingualism is much broader and less

exclusive, with the emphasis being placed on the "more than one." According to

Stavenhagen (1990), five to eight thousand different ethnic groups reside in

approximately 160 nation states. Furthermore, scholars estimate that there are over 5000

distinct languages spoken in that same small number of nation states. These numbers

would seem to indicate that very few nations are monolingual but rather, that many of the

world's nations have groups of individuals living within their borders who use other

languages in addition to the national or official language to function in their everyday

lives. For some countries such as Belgium, Canada and Switzerland more than one

language is recognized as the official language; In Europe, many people, especially those

engaged in intellectual activities, have competence in more than one language and have

some acquaintance with another or several others; Historical factors such as colonization

have also contributed to this bi/multilingualism in many nations around the world: In

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[3] http://www.linguisticsociety.org/resource/multilingualism

Africa for instance, many individuals speak one or several African languages and also speak a European language, most notably English or French.

5.1.2 Information literacy

In the contemporary environment of rapid technological advancements and an abundance of information resources, being information literate is invaluable. As a concept, information literacy has been defined as a set of abilities requiring individuals to recognize when they require information and have the ability to locate, evaluate and use effectively the needed information[4]. Doyle (1994), further expounded on this and arrived at ten essential qualities of someone who is information literate; such a person: "(i) recognizes the need for information; (ii) appreciates the importance of accurate and complete information to make intelligent decisions; (iii) formulates questions based on information needs; (iv) identifies potential sources of information; (v) develops appropriate search strategies; (vi) accesses sources of information including computer-based and other technologies; (vii) evaluates information; (viii) organizes information for its practical application; (ix) integrates new information into an existing body of knowledge; and (x) uses information in critical thinking and problem solving." (p.3)

The importance of promoting multilingual information literacy is evident when we consider the fact that with the exponential growth of information on the Internet, information seeking and retrieval across national borders, cultures and languages are

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[4] American Library Association. Presidential Committee on Information Literacy. Final Report. (Chicago: American Library Association, 1989.)

constantly on the rise. Moreover, information dissemination and sharing amongst different nations is also becoming increasingly important in a world where collaborations are needed on issues such as environment, trade, and the fight against terrorism. In addition to the internet, the growth of digital libraries also makes it possible for individuals to access information regardless of their geographical location. However, some of this information may be inaccessible to them due to language barriers, thereby creating a form of digital divide. The European Commission on Information Society and Media, (2006) aptly observes that the answer to overcoming this digital divide may lie in multilingual information literacy: "A key factor to the future success of digital libraries is the provision of appropriate multilingual services to allow users to find, explore and work with content in multiple languages" (as cited in Clough & Eleta, 2010, p.93)

In this article, the two aspects discussed above are combined to broadly define multilingual information literacy as: *the ability to find, retrieve, analyze and use information regardless of what language it is written in*.

The current article discusses results from focus group discussions of bi/multilingual international students at a Canadian university, and their perspectives on multilingual information literacy. The article also discusses the role that LIS (Library & Information Science) professionals could play in promoting multilingual information literacy and also the challenges they themselves face in providing services in an increasingly multilingual, multicultural world. Additionally, the study aims at identifying the language related challenges that bi/multilingual users face while searching for information online and the role that technological advancements (primarily multilingual information access tools) and information literacy or library instruction could play in alleviating these challenges.

5.2 Related studies

A number of user-centered studies in LIS (Library & Information Science) literature have explored language issues and how they impact information seeking behavior. These studies have mainly been done in the context of services to international students or services to ESL (English as a Second Language) students. There exists however, a dearth of studies that make the connection between language issues and information literacy. As Peters et al, 2005 point out: "Yet very little has been published about the library's role in the multilingual or cross-language aspects of information literacy, with most of the relevant research conducted in Europe and Asia."(as cited in Valentine, 2008, p.199).

5.2.1 International students

Amsberry (2008) observes that as higher education becomes increasingly interested in issues of diversity and internationalization, academic libraries will need to find a way to prioritize the needs of international students. However, as other studies show, this is far from reality: Knight, Hight and Polfer (2010) for instance reported in their study that international students were an underserved population who used the library primarily as a place for study; their study advocates for more outreach to international students; recommending that academic librarians take simple, practical steps to encourage this group of students to use all library resources and services. One of the challenges most documented in the literature regarding international students and their access to information services and libraries is that of language barriers. The studies mentioned here will focus on language barriers especially in the online environment and as they relate to information literacy. Amsberry (2008) further argues that language is the primary barrier

for international students in library instruction classes. Her paper on teacher talk concludes with suggestions for librarians working with international students, including understanding that students' challenges are linguistic not intellectual, avoiding idioms and cultural references, limiting the use of library jargon and asking open-ended questions rather than yes or no questions. In using information, international students may have difficulties understanding academic rules such as plagiarism and copyright as a result of cultural differences in attitudes towards intellectual property (Badke, 2002; Baron & Strout-Dapaz, 2001; Feldman, 1989; Morrissey & Given, 2006). In a study involving Japanese international students at Dalhousie University, Ishimura, Howard and Moukdad (2007) concluded that the students needed *language* support to complete their assignments. Morrissey and Given (2006) also document a study of information literacy skills among Chinese students, finding that language fluency, especially for library jargon, understanding of library organization, and the role of professional librarians affects the students' use of the library. Given these challenges, a number of studies have suggested that providing library instruction in international students' native languages is beneficial for them (Bosch & Molteni, 2011; Liu & Winn, 2009; Puente, Gray & Agnew, 2009; Jackson, 2005; Chakraborty & Tunnon, 2002; Spanfelner, 1991). Liestman and Wu (1990) went further and tested this, making a strong case for translated materials as an efficient and successful tool for library orientation and instruction: their study reports the results of library orientation sessions for international students that were offered to one group in English and to another control group in their native language, Chinese. Pre and post test results indicated only a modest increase in the scores for the group receiving

library instruction in English while the group receiving library instruction in Chinese increased their post test scores significantly.

Other studies have documented the linguistic related difficulties that international students face while searching for information in electronic databases and in OPACs: DiMartino, Ferns, and Swacker (1995) assert that international students have difficulties searching databases as a result of their limited knowledge of English and tend to search by "trial and error". Zhuo, Emanuel, and Jiao (2007) in their study on International students and their language preferences while using library databases found that many were not aware of the specialized language features on some of the electronic databases. Based on the results of this study, they recommended bilingual library instruction and multilingual library tutorials. In his research involving Korean students at the ACTS (Associated Canadian Theological Schools), Badke (2011) found that students struggled with formulating search terminology- especially when it came to keyword searching with synonyms. He reported too that the students experienced difficulties in assessing the relevance of the results they retrieved due to their lack of proficiency in English. Ganster (2011) conducted focus group interviews with international students at the State University of New York at Buffalo, with some positive outcomes resulting from the focus group discussions, such as : the discussions helped librarians to understand the needs of new international students and tailor web resources accordingly; this led to the implementation of the *Resources for International Students Web Guide* which supports library outreach to a multicultural and multilingual audience; and in addition, the discussions also helped create awareness of the international students' cultural challenges. The aforementioned study by Ganster (2011) informed the methodology used

in the current study: focus group discussions were used to gather more information about students' opinions on multilingual information literacy and also made it possible for the researcher to gather more information e.g. explanations of their responses on the web survey (discussed in chapter 3) and explanations of some of their actions in the experiment phase (discussed in chapter 4).

5.2.2 ESL (English as a Second Language) students

Various studies involving ESL students and their use of libraries have found that language proficiency does impact their use of libraries and electronic databases. Bagnole and Miller (2003) for instance, found that ESL students' inability to use synonyms put them at a disadvantage due to barriers of language and suggested that keyword worksheets might be an effective way of helping ESL students to learn effective techniques for searching.   In a study that used phenomenology to explore the information literacy experiences of EFL students, Johnston, Partridge & Hughes (2014) found that EFL students faced a number of language related challenges which affected their experiences of accessing, reading, understanding and translating information. They also noted that EFL students had a preference for translating from English to their native language and experienced many barriers when they had to translate information from their own language to English. Walker and Click (2011) also found that the most prevalent challenge related to working with ESL students is certainly the language barrier, noting also that even undergraduate students who are native English speakers often find research databases difficult to use: "choosing appropriate keywords and using controlled vocabulary are skills that must be learned, and these skills become even more

difficult to develop for ESL students" (p.21). In a study that explored how library use could foster language learning by non-native English speakers, Bordonaro (2010) made a positive connection between database searching and language learning suggesting that vocabulary learning strategies used during database searching could indeed be considered a language learning activity. In a study that was conducted about Taiwanese EFL (English as a Foreign Language) students' perceptions of a research writing project, Yeh (2009) found that students encountered a number of difficulties when doing a research writing project including: lack of English writing proficiency and a lack of research experience and knowledge. Additionally, the study found that the inability to select useful resources, slow reading speed, difficulty in paraphrasing texts in English and difficulty in translating Chinese resources into English presented significant challenges for this group of students.

In regard to information literacy instruction, many studies have found that cultural differences, learning style differences, and lack of knowledge of libraries hinder ESL (English as a Second Language) students' understanding during the "one shot" library session that is offered on most university campuses. McDonald and Sarkodie-Mensah (1988) for instance, found that American librarians found difficulty in "code-switching" in order to accommodate the language and communication challenges of ESL students; they suggested "Analogy, universal humor, hands-on experience, and an integrated program involving ESL and library personnel" as effective ways of dealing with these challenges. (p.425). Bordonaro (2011) suggests incorporating language learning strategies into library instruction sessions for ESL students and posits that this could give

ESL students increased opportunities to become better learners in language and library learning.

5.2.3 Librarians & services to international students & ESL students

Though fewer, there have been studies that have sought to document librarians' perspectives on serving this student population. Ishimura and Bartlett (2014) investigated librarians' experience in teaching international students and found that most of the challenges they faced had to do with three main areas: differing educational systems/ academic expectations, differing academic library systems (from those of the students' native countries) and language and communication problems. Their study found that the librarians relied more on their experience or the idea that "practice makes perfect" instead of the skills they acquired through other means such as continuing education. They further suggest that it is important for librarians to improve their competencies in this area and recommend that professional organizations and academic institutions provide opportunities for continuing education in this area.

In a study that surveyed American and Canadian librarians, Bordonaro (2013) found that although there was some evidence that some librarians offered specialized instructional programming for international users, this did not occupy significant amounts of their time. Furthermore, a majority of the respondents in Bordonaro's study (80%) indicated that they did not provide library materials or services for international users in languages other than English. However, the study found that there was in general support for the *language learning needs* of international users through material in the collection.

Nzivo and Chuanfu (2012) present a different perspective involving international students who are native-English speakers studying in China. The study found that these students hardly used library resources, even though slightly over half of the respondents (51.6%) reported that they faced either *no* difficulties or *minimal* difficulties in communicating with the librarians or accessing the material they needed. Conversely, 51.4% of the librarians who participated in the study indicated that they faced communication difficulties due to a language barrier. The study recommended that efforts should be made by the librarians to improve their English proficiency. Other studies done in China (Aihong, 2009; Shao & Scherlen, 2011), recommended the same, thus placing the onus on the librarian rather than on the student to improve their language proficiency.

Conteh-Morgan bemoans the prevalent "deficit approach" taken by many previous studies that have dealt with issues concerning international students and their use of libraries, where this student population is often presented as problematic and challenging. She calls for an adjustment in our mindset and in our way of thinking about work with international students:

> "The insistence on *difference* and the negative meanings imputed to them and the persistence of these in the literature over the decades have led librarians, whether consciously or unconsciously to construct a one dimensional image of international students. These students are depicted as constituting an accretion of deficits and this image has stuck in the collective minds of librarians" (as cited in Bordonaro, 2013, p.xiii).

With a specific focus on language issues and information literacy, the current study seeks to contribute, build on and enhance these earlier studies by presenting perspectives

from both the students and the librarians and aims at emphasizing the roles that different stakeholders (IR system designers, librarians and students) could play in enhancing multilingual information literacy.

5.3 Research questions

In seeking to gain a better understanding of the information searching behavior of bi/multilingual academic users and the role that LIS professionals and IR system designers could potentially play this study addressed the following research questions:

1. What linguistic challenges do bi/multilingual non-native English speakers face while searching for information online?

2. What are their opinions regarding how these can be / are being addressed through a) MLIA (Multilingual Information Access tools) and b) Through Information Literacy instruction?

3. What are the librarians' experiences and / or perspectives in providing services to bi/multilingual academic users and in particular non-native English speakers?

4. What current aspects of IL in general could be applied in offering services to international students/ ESL students?

5.4 Methodology

5.4.1 Student focus group discussions

In this study, a purposive sample was used, with international students and ESL students being targeted for recruitment, solely because of the focus on language issues, not because of any other characteristics. The assumption was that they are likely to speak one other language in addition to English. In this phase of the study, focus group discussions

with the students and interviews with the librarians were used for data collection. The

purpose of the focus group interviews was to enhance the contextual richness and

minimize artificiality. Focus group discussions were also used so as to take advantage of

the dynamics created by group discussion. Lederman, (1996) points out that when using

focus groups the dynamic of the group is thought to bring out aspects of the topic that

may not have been anticipated by the researcher. This was crucial in helping the

researcher understand the information seeking behavior of the participants, e.g. why they

make the choices they make, why they would choose to use certain MLIA tools or not,

and what role English language proficiency played in their Everyday Life Information

Seeking (Salvolainen, 1999). The focus group discussions were also appropriate because

they provided the participants with an opportunity to reflect orally on their general

use/non use of the MLIA tools and their perceptions of these tools. Focus group

discussions were also deemed advantageous in that they would allow the participants to

communicate feelings and attitudes without having to choose from a selection of

responses as was the case with the first phase of the study where a web survey was used.

Participants in the focus groups were recruited from the first phase of the three-phase

study. This first phase, discussed in Chapter 3 of this dissertation involved a web survey

that was done among international students and ESL students. Out of the 250 students

who responded to the survey, 54 students signed up to participate in the focus group

discussions. A doodle poll was set up with various dates and times for the participants to

choose from, and this reduced the number to 23 participants. A total of 4 focus groups

discussions were held on different days / times in March 2014, and a total of 19

international students from the University of Western Ontario and its affiliated colleges

participated.   The focus groups each lasted between 45 minutes -1.5 hours. The

researcher obtained written consent from the participants and recorded all sessions using

a digital voice recorder. To gather some basic demographic information, students were

asked to fill out a form (see Appendix C) with questions in regard to their gender, age,

level in college and discipline/ major in college. All discussion sessions were held in one

of the rooms in the Faculty of Information and Media Studies at the University of

Western Ontario and were moderated by the researcher. Before the discussion began,

participants watched a short introductory video tutorial on how to use some of the MLIA

tools available on Google and WorldCat. Two previous phases of the study (discussed in

Chapters 3 and 4) had revealed a general lack of awareness of these tools and so the

researcher felt the need to show the video so as to introduce students to the tools and

prepare them for the discussion. In order to break the ice, put the participants at ease and

create an atmosphere that could foster participation and engagement, the researcher was

careful to mention in the introduction that she was an international student herself and

was also multilingual. A focus group guide, created by the researcher, identified key

questions to be used in order to stimulate discussion and elicit feedback. The discussions

focused on language related challenges that the students encountered in everyday life

situations and specifically while searching for information in the online information

environment. They were also asked to describe what kind of emotions they go through

while searching for information in a language in which they may not be proficient. The

discussion then moved on to MLIA tools and their past use of these tools and their

perceptions of them. In regard to information literacy, the discussion centered on what

kind of library services the participants were familiar with, and which of these they had

taken advantage of. Particular focus was given to information literacy instruction, as this is one of the ways linguistic related challenges in online information searching could be addressed. The researcher therefore asked participants if they had attended an information literacy instruction session in the past and what topics were covered. The researcher then asked participants what topics they would like to see addressed in these sessions. For the specific questions that were used in the discussion, see the discussion guide in Appendix C.

5.4.2 Librarian interviews

To gather information regarding the librarians' perspectives on multilingual information literacy and information literacy in general, the researcher sent out an invitation to instruction services librarians at the University of Western Ontario and its affiliate colleges and universities. A total of 8 librarians signed up. However due to scheduling conflicts, only 6 interviews were held. The interviews were held in the participants' (librarians') offices. All participating librarians were involved or had experience providing information literacy instruction. Semi-structured interviews were conducted using some guiding predetermined questions (see Appendix C). The questions centered on the two themes of the study- information literacy and service to bi/multilingual patrons. The results/ findings from both the focus group discussions and the librarian interviews are discussed in the next section.

5.5 Results

5.5.1 Focus group discussions

The total number of participants per group ranged between 4 and 6. The group dynamics varied, depending on the size of the group. The groups that had more participants had an easy flow, often running for slightly over an hour, while the groups that had fewer participants followed the discussion guide more closely and were often completed within the anticipated 45 minutes to 1 hour time allocation. Comfort level with carrying out a conversation in English seemed to be a factor too, with long pauses for those who *seemed* to have lower proficiency levels in their active (speaking, writing) English language skills. Additionally, for these participants, phrases like "...I don't know how to say in English…" were often interspersed in their responses.

A total of 15 countries were represented in the discussions: China, Columbia, France, Germany, Hong Kong, India, Indonesia, Iran, Kazakhstan, Kenya, Pakistan, Saudi Arabia, Singapore, Sweden and Vietnam. In addition to English, which was the language of the discussion, other languages represented included: Chinese, French, German, Swedish, Marathi, Malay, Bengali, Arabic, Russian, Kazakh, Spanish, Vietnamese, Bahasa Indonesia, Urdu, Swahili and Hindi. A summary of the profiles of the students who participated is presented in the pie charts in Figure 5.1. Most (16) students fell in the 18-25 age category and a variety of disciplines were represented, with 12 students coming from the Arts, Humanities and Social sciences and 7 coming from STEM (Science, Technology, Engineering & Mathematics) and Medicine. There were 6 students who self-identified as male while 13 self -identified as female. 12 were

undergraduates while 7 were graduate students. Average length of time for using the

internet was 11years while average length of time using electronic databases was 6 years.

Figure 5.1a: Student profile summary: Discipline
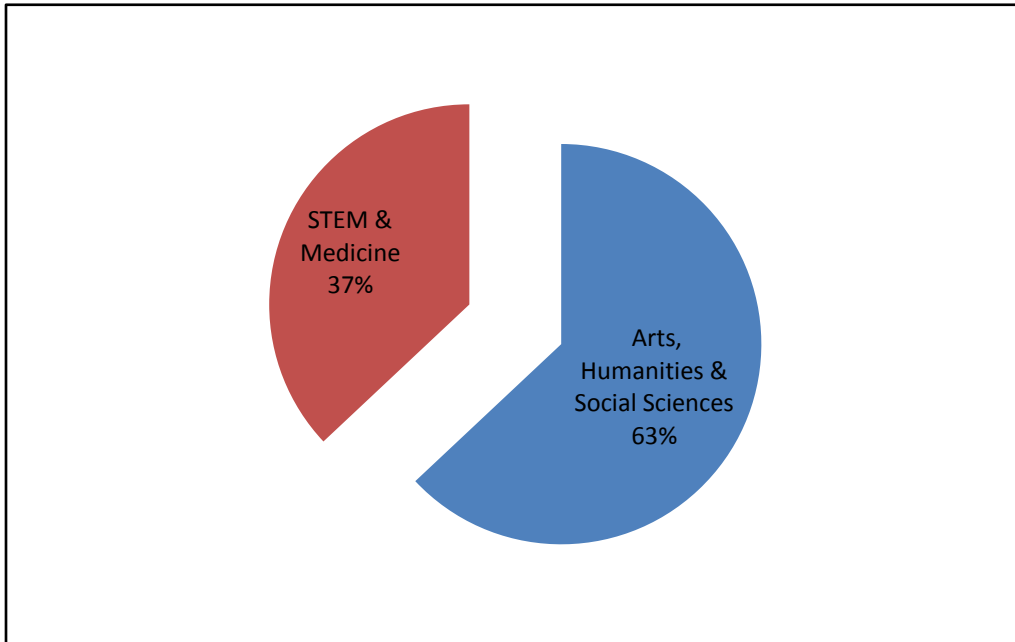
Figure 5.1b : Student profile summary: Gender
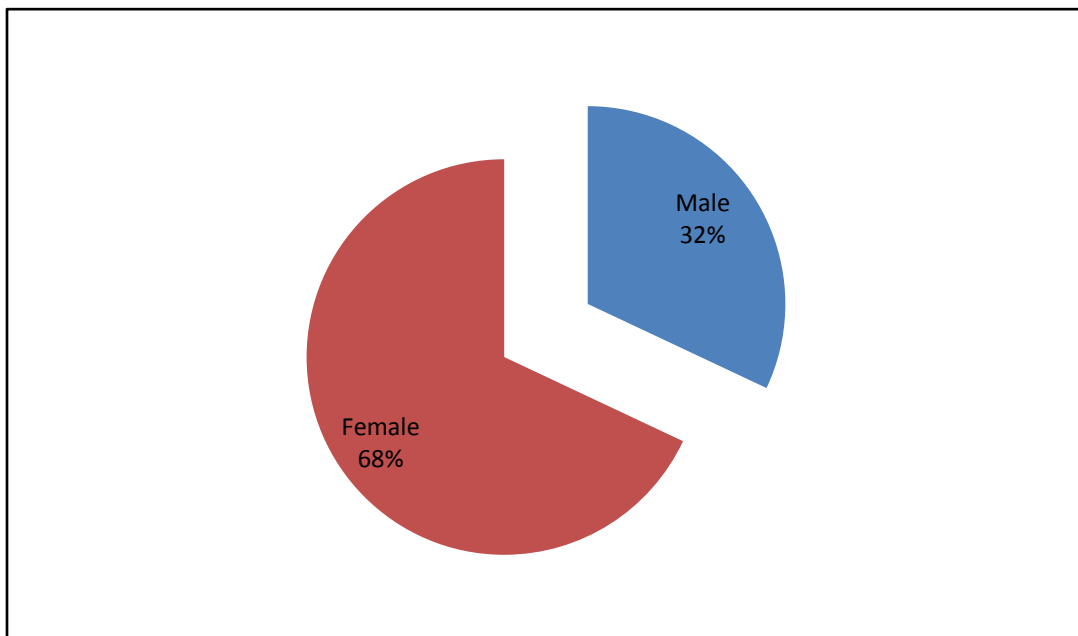
Figure 5.1c: Student profile summary: Level in college
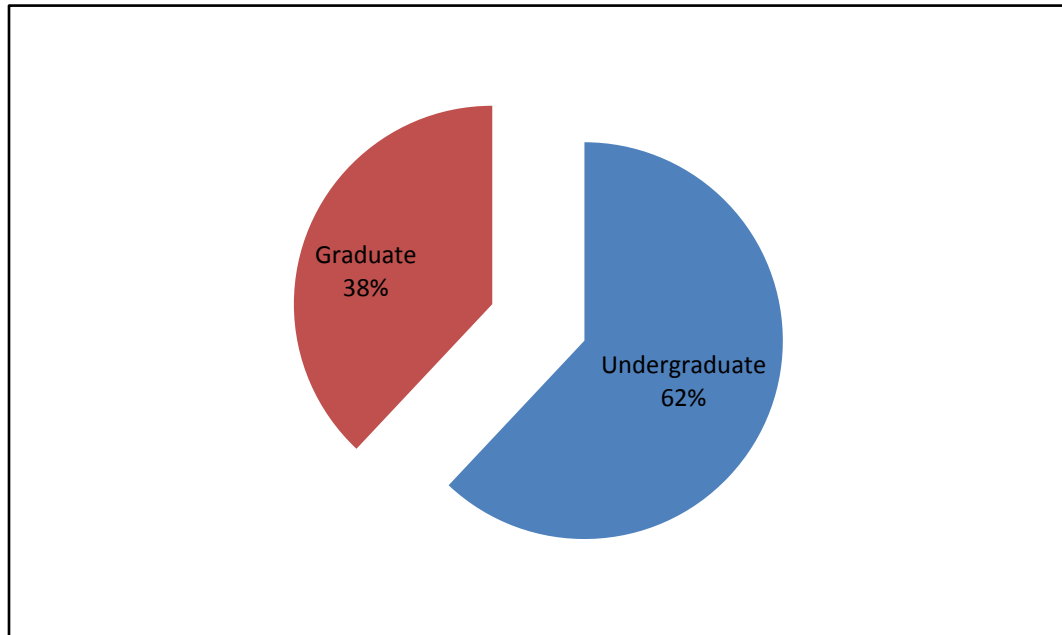
Source: Author's Focus Groups Discussion data

The digital audio files from the discussions were transcribed by the researcher for further analysis. An inductive method was then used to identify and categorize the comments made by the participants during the FGD's and the interviews. The unit of analysis was similar to what Ericsson and Simon (1993) refer to as verbal statements. These were of any length, and constituted any statements emanating from the conversations from the discussions. The researcher used an inductive method to identify and categorize the comments made by the participants. The researcher used open coding as the main categorization strategy, identifying themes that were common across all the focus group discussions. These categories or themes were then further examined to determine their relationship with multilingual information literacy and the objectives of the study as a whole.

Student perspectives

In this section themes that were common among the discussion groups are discussed. The examples given under each of the themes also highlight how these situations / or challenges could be mitigated by the use of multilingual information access tools. A subsection is also included that discusses the use or non-use of multilingual information access tools and the students' perceptions and opinions of these experiences.

Language & Academics

Language and how it impacts the students' education or academics was one of the major themes that emerged in many of the discussions. Examples are given below:

One student decried the fact that not that many scholarly publications in other languages other than English exist:

> *"I'm not sure how many articles that is in different languages but I feel like the majority of it would be English. So if they could have articles in other languages I think that would be helpful."*

> *"Some courses are taught in English. I'd say actually in Psychology, half or more than half would be in English because it's such a well-known field, and the field is very broad. And there's a lot of terms, of research coming from America. So a lot of terms are actually, like I would prefer to use them in English because it's just easier that way. Ideas are better and wider and the concepts are understood by most people in English. So it's actually easier to do in English."*

Another student presented a different angle to this problem, noting that in order for her scholarly work to be published and widely read, she would have to publish it in English:

> *"Yeah, that's like because I think everything's mostly published in English because it's known as kind of the "universal" language. So, yeah, even people from—For example, if I'm going to be a researcher in the future and by God's grace an article of mine gets published, I am going to publish it in English rather than Hindi, because that's what's going to get me more success rather than*

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getting it out in Hindi. Right? So, that's going to be online and that's what people are going to find. Not its Hindi version, right? So, yeah, that's the thing."

In the example below, a student captured the essence of a cross language search that would enable one to enter search terms in one language, and retrieve all the relevant articles regardless of the language they're written in. He notes how a multilingual search could be beneficial while doing scholarly research:

> *"Especially if you do academic research. You just search everything in English but then who knows maybe there's something out in your language or in French or something, that you need to double check, maybe, if something is existing. Even if this search is useful just to find that there is an article on…I don't know, let's say, obesity, for instance. Although you'll not really understand the article, you might then contact these people. Maybe ask a professional translator or something—or contact them directly. To maybe help them to translate that in English or in your language. So that you will know that this research really does exist."*

As in the two examples given below, students acknowledged that though they have become proficient in English and they may not experience as many language barriers right now, this was not always the case, and also this is certainly not the case for many people around the world who may still lack the proficiency to understand a lot of the information that is published in English:

> *"Yeah. In my case maybe like five or six years ago, when my English was not as good I would have always searched in French then try to translate it in English. But actually it's really time consuming so now if the work given is in English, I directly search in English not using the translation tools. And if my work is in French then I'm working in French. It's more efficient in terms of like according source or like citing, but I think I'm doing that just now because I'm feeling comfortable reading it all in English.   That was not the case before, then I was using that kind of tool."*

> *"Mainly because like in the university when they're taking everyone, they're making sure like everyone is English proficient. So in the university it really does*

not matter...but when you go back home and see in your own country where people really don't know English and they're having academic problems because of that. So, that's where actually these tools can be really helpful. Because we all—for me, yeah, I'm pretty proficient in English so whatever articles I get I understand at least 90% of them apart from maybe a few words. But I know like people back home who are not that good in English and while they like studying, they actually have a lot of problems. They cannot understand even the simple words."

"But in China, for example when we graduated from the bachelor's degree, we must finish our thesis and the abstract must be in English. But a lot of students used the Google translator to translation all the paragraphs. It's just unbelievable to understand that stuff in English. So a lot of professors said, "You cannot use Google Translator to do that." A lot of students don't use this software and they don't know what to use. They don't know how to do this. So, I think probably, the Google Translate can be improved so as to help other people in other countries. "

Despite this appreciation for their proficiency in English, some language related

challenges were acknowledged by some students as in the cases below:

*" Even though I understand English very well, I still prefer my language. Whenever I see English or another language **I get worried** and I skip over it"*

"For me information in English is like a maze. I will try to search for something for a long time. It's so frustrating. I try to search for the KW in the whole article. I will have no patience to read the whole thing."

In the conversations below, the **frustration** of finding the right key words during a search

are discussed among the participants*:*

P3: I can get really frustrated and annoyed when I don't find the thing I want and I have to search and search and search.

P2: I tried different word and then different tense. Try to paraphrase and rephrase it in different way hoping that you're gonna get what you want. Is it usually an issue of just not finding the right term to use like the right keyword or what do you think the problem is?

P4: I think it's more about the keyword cause if you type in like the parallel keyword, it would give you 2 different results. Sometimes you might just mess up one word and then you can't look for what you want to see.

P3: Sometimes I find it like I have a version in my head. Like the Swedish search words and like the idea that I, the idea of the way I have to do it. Sometimes it doesn't translate well when I do it in English. And I find it frustrating like when I, that I have to do it so many steps. Cause I know what I want to find but I can't find it.

Another challenge the students expressed was in interpreting or understanding information in the bibliographic record:

"I just find them sometimes a bit like messy or cluttered. Sometimes there are so much information on such a little space. Like you're using the author, the year, the ISSBN, and all those things. I think it would be easier if you just had like the title. Maybe the author and the year and then if you could click on it you go to the abstract and all those things. But there's so much text. So sometimes I find it a bit tiring that you have to actually try to differentiate what is the title and what is the abstract."

Though this may not entirely be a language issue, some of the linguistic challenges presented in the example above could be addressed through the use of multilingual interfaces, and translations of the main parts of the bibliographic record such as title, descriptors or subjects, and abstracts.

In the examples below, students correctly noted that the search language or the language the key words are entered in will have an impact on the search results. The students also correctly noted the link between language and geography and how this can affect the results of a search:

"... I think is because the reason that when you type in the keywords in different languages they give you different results. So I feel like let's say if you want some information about Germany that really specific information, I always feel like if I

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can type in German then I would get like more accurate more local information that I need. But I can't do it yeah."

Commenting on a shopping task that was done in the second phase of this study:

Honestly, it was the first time to use this kind of tool (CLIR search.) It was useful and I learnt a lot through the experiment. To find something to buy in China I don't use Google, also I don't use English. I use Baidu (Chinese search Engine), or prefer my mother language. If you use Baidu it's much easier to find something that is in Chinese but when you use Google, then its international and you won't find many websites that are inside China but when you use Baidu most of the websites are in China.

In the example below a student who was doing business related research noted the difficulties she experienced trying to find information on a company in another country; even though she was doing her search in English.

And sometimes when I do like some business research, and then like some case I have to do for example like in Asia like Vietnam or China. And they don't have English translation. Yeah it's really, really hard to find information on the company. For example like in Venezuela or some company like that they don't have some country like they don't have reliable sources. Like in English you have to try and look it up in their own language. And it's just so hard like some country I don't even know how to find it. For example Venezuela or Argentina. I cannot find the database of these companies."

Language & Culture

Language and culture are often interconnected; not surprisingly therefore this is a theme that emerged from the discussions, mainly in the context of the students experiencing challenges in expressing themselves. In the online environment as well, students indicated experiencing difficulties in translating certain words that are deeply rooted in the culture. Examples given below are taken from the subject of cuisine, which is often a

subject that has deep cultural roots. A coping mechanism they used for this was to give a

description in many words. One participant said:

> *"...Yeah and then like for example like in Vietnam we have a lot of different dishes. There's, there is some stuff that doesn't even exist like in America or North America so like sometimes I could not find a word that I'd like to translate the right translation. So I just type in the description like okay this is the combination of what and what and hoping that like it is gonna pop out."*

> *"That will give you like a better understanding like more accurate. Also some background like for people in China we don't speak English that often. Like everything is just in Chinese. Well something well there are some places that have English menu or something but it's not that good English."*

Students also noted that information about a specific region- e.g. news was better relayed

in the language spoken in that country:

> *"I believe when you are learning something, like issues specifically in a region, you have to look in that language. So if you want to know issues about what happened at home, like for me like what happened in Indonesia, I will search issue in Indonesian because in English it wouldn't give much more information and it's also like, there are some words that you just cannot translate into your own language. "*

Language, politics & power

The dominance of English was noted in various instances; not in a negative way but in

some ways to show that knowledge of English is beneficial not just for them, but for

others in their native countries, who out of necessity may need to access information in

English. The dominance of English was also noted in the sense that many of the students

mentioned having been exposed to English either as a language of instruction or as an

academic requirement in school:

> *"[The language of instruction is]Vietnamese yeah. And then we study, we study English as a second language when we're in elementary school or high school.*

And Vietnamese, especially with Vietnamese we used to be French colonized so some people speak French too. Like my grandma and my grandpa."

"Yeah. We learn two languages in Singapore. One is Marathang. For me I'm Chinese so I learn Mandarin and we actually use English as official language."

English in everyday life situations e.g. in Sweden:

"…Cause English is very accessible in Sweden. Instructions are given in the Scandinavian languages and English always. Like if you buy a new coffee maker or something you'll find it [instructions] in English as well. So it is very accessible."

Students noted too, that availability of MLIA tools say on Google was determined by

politics, power and economics:

"But isn't there sort of a power relation involved? In what languages gets taken across. I remember working as a journalist in Kenya and Tanzania, then Google translate took me to Swahili. I forget the other languages of the region. The Swahili was atrocious. So far as I could tell. But when I tried to do it in Hindi, which has a far larger number of speakers, it seems to be working much better. But then in Bengali, which is my language, even though it's spoken by a fair number of people actually in India, the translation was not so good. There is a particular power plus economic dimension to it…"

"For *me it's those region specific problems that I was highlighting before which is the frustration of this. Not to be able to get like you guys were saying is. So I want to find out something in a place where the language is spoken which is not one you know is highly important language in the world. There is a serious information gap that I can see happening.*

The observation noted above by this student is true- not just for Google translate, but in

general in regard to translation tools. For instance, bilingual dictionaries exist between

English and Russian and English and Swahili but not Russian and Swahili. This is the

case for many language pairs, bearing testament to the dominance of English. In the

online environment, this means that English will often be used as a pivot language for a translation between two other languages. Scholars in translation studies have noted that this "extra" step will often increase the occurrence of inaccuracies in the translation. Some studies for instance, have highlighted a bias towards English on the web, and suggested that this bias creates a digital divide based on language barriers (Paolillo, 2005; Kralisch, 2005; Kralisch & Mandl, 2006; Flammia & Saunders, 2007; Berendt & Kralisch, 2009).

In other instances, however, politics and pride meant that certain texts could not be translated or made available in other languages:

> *"I actually had one of those problems in class just like a week ago. The prof asked us to find a group and organization that is extreme in some way. So it could be religious or political or something. And we went with, with a nationalist German political party. Since they're nationalists and they're not for migration or immigration they only have the website in German. Cause they like it is their belief that they don't need to do it in English or in another language."*

Another student noted that the role that language played in politics often introduced bias in the information that was presented leading one to question the veracity of the information and in turn leading to uncertainty:

> *P1: "I had a recent experience in doing that, given that I'm not proficient in French and I was doing this- taking this political science course and I took a topic :'Why does Quebec always want to be separated from Canada?' And for that there were some articles which were in French and I had like no idea, so when I started translating using Google Translator there was always this sense of uncertainty and thinking what if this information or this translation system is not 100% reliable? So I guess, for me it's more like, if this is 100% true? Because every language has its own way, its own dialects and I don't know how accurate Google is, because I have no clue about French. I don't even know what a burger is in French, so, I guess there's always uncertainty. What do you guys think?"*

P5: *"Even like the Russian and Ukraine situation. A friend of mine who understands both Russian and Ukrainian was telling me that when you read the Russian newspapers they have a different take on what's going on. If you read it in Ukrainian you will also find a different take, so what you're saying is absolutely true."*

Experience with multilingual information access tools

Most of the participants said they were familiar with machine translation and in particular Google translate and had used it before. They however decried the inaccuracies inherent in machine translation and noted that sometimes this created a situation of uncertainty and not knowing whether the information one was reading was true or not, and sometimes the translation was unintelligible or was full of grammatical errors:

"But sometimes Google Translate's not really reliable. You type it and then it just comes like this weird form of language."

"The thing with Google translate, mainly, is like grammar. If you translate sentences, the grammar is sometimes messed up."

The lack of context, enabling them to choose the right translation was also mentioned by the students as a challenge they often encountered with machine translation:

"...—again, if we take Google Translate, one thing that I found problematic is when, sometimes, you need to search one word, right? And I think, as you mentioned, there are at least ten or fifteen different versions of just a single word— there are ten to fifteen or even more different version of how this can be translated and Google translate give you everything. If you really don't know what are the differences between those different versions, it's very hard to tell you if it's not your native language. There are fifteen different options, and you will think that these five ones seems similar, so, what should I choose? Right? It's very context-specific. Google translate for instance might be better doing off doing some, I don't know, clustering... Let's say, if there are fifteen words, maybe it will give you an example of a sentence."

Because of the inaccuracies in machine translations, some of the students acknowledged

that they would not use Google translate for academics but for other tasks such as in

social media:

*"I wouldn't use Google translate or stuff for English. I would use it for my third and
fourth languages. Like Spanish and French. I did that in high school. So I wouldn't say I
speak it fluently but I do understand most of it when it's spoken or read to me or if I could
read it myself. So I think it's great for languages that you wouldn't use in your everyday
life."*

*"And yeah, I have used it [Google translate] many times before, actually, with different
languages. I had French for three years, so I used it at that time. Sometimes even like
just while maybe browsing through Facebook or any other websites, if you want to
translate some—Maybe say a basic word like, something like a vegetable or fruit or
anything like that, if you want to translate it to English and if I want to know what is
called in my language… I used sometimes Google translate for that, too.*

As shown in the examples that follow, despite the inaccuracies, students appreciated

certain features in Google translate such as: the ability to translate a whole webpage, the

pronunciation feature, the virtual keyboard and the "suggest a translation" feature.

*"I just want to say if we are talking on the topic of Google Translate. I really find
the application, where you can drag the entire URL and drop it, how it really
translates the entire website, extremely useful."*

*"But the good thing about that, about Google translate, one thing is that it offers
pronunciation. There's a small speaker kind of a thing. If you click on that, it gives
you the pronunciation in both the languages, that you are translating from and to.
Even the worldwide keyboard thing, it's really helpful. Because when you're
translating from… Because, obviously, our laptops and stuff, they don't have—
They have only English keyboards. Right? They don't have any of the other
language keyboards. So, you need a worldwide keyboard sometimes to write
something in Hindi or something. So, that's another good thing."*

*"Yes you can suggest, I mean, that is pretty much with everything even if you are
in Google Maps ... you can report it and they'll actually get back to you saying
that they have corrected it. I did it once for my own language because you know*

when you're curious you're just searching and you think this is not right, and then I reported in and probably a month later I had an email saying that 'We have made the changes.' And something like that. It was a long time back so I don't remember the contents but I did get a notification that they'd corrected it, which is a good thing."

In the example below the student describes a situation where Google translation came in handy in carrying out a business transaction:

"...Especially I remember one particular conversation I had with a Costa Rican telephone service operator. She was trying to sell me a telephone connection and we chatted through Google Translate because between her English and my Spanish, we couldn't..."

Students also expressed a desire to see more MLIA tools or advanced features offered in

electronic databases:

"...I don't know, maybe, in terms of these—EBSCOhost and ProQuest, etcetera, maybe they can not only just simple translation, like interface, but maybe do some advanced search features or something, so that I can do practically the same thing as Google translator's doing, right? Like what we just saw in the video. Maybe that would be useful to people."

A student who had just been introduced to the cross language search tool during the

second phase of the study noted:

"I like the cross language tool; I didn't know it was existing before this morning, actually? So when I was looking for an English word, like a complicated one that I don't know. Often I was going on Wikipedia French page and put on the language and English then I had translation with the word."

The examples given above highlight situations where MLIA tools did play a role or could

play a role in alleviating the language problems encountered. They also highlight the

importance of multilingual information literacy, in particular for these students, and how it could promote their learning and achievement.

Information literacy

In general, most of the students said they had not attended an information literacy session or a library tour. Those who had attended these sessions admitted that the sessions had not addressed language issues. As can be seen in the quotes below, some of the students felt that if the sessions were made mandatory, they would perhaps attend them. Topics that students would like to see covered were varied and included: plagiarism, evaluating resources regarding what is scholarly or not, using the online learning management system at the University of Western Ontario, MLIA tools, in text citations, database searching techniques, a physical tour of the library. The following quotes though not exhaustive, are examples of what the students had to say in regard to information literacy:

> *"I think it's good that you have a debate of what is scholarly accepted and not. I mean most people know that you shouldn't trust Wikipedia but apparently profs still do get citations from Wikipedia so obviously people don't realize that you need to actually differentiate what is good academic writing and not. I think that's good. It should be like a part of a discussion or a debate."*

> *"Yeah, plagiarism. Yeah when you use like a lot you use them excessively, like you can get into trouble with that."*

> *"For my classes, more about what the databases are about and how do we access them."*

> *"Maybe a physical tour, like show us where the books are. Because after we know how to use online database sometimes it might be also helpful for us to read the books and articles like just to try and find something in the library. And I have no idea where those things are. So it might be helpful if they can kind of like show a map like tell us where like oh for this section we have this book and that section we have those books. That might be helpful."*

However some students felt that librarians or instructors should make it clear what topics will be covered so they can decide whether to attend the session or not. This plus the fact that students had different views on which topics to be covered would seem to support some form of specialized information literacy instruction or personalized information literacy instruction.

In general, the students enjoyed participating in the focus group discussions and appreciated the opportunity to air their opinions about issues that they felt were important to them. One student said:

> "*You should do this kind of research more often. It makes me proud to be bilingual!*"

Summary

The focus group discussions centered mainly on language more than information literacy. This could be attributed to the fact that most students had not attended an IL session and so were not familiar with what it entails; while for the discussions on language and information searching, students could relate to the topic- i.e. language and how it impacts their information searching- both in ELIS (Everyday Life Information Seeking) (Salvolainen, 1999), on topics such as shopping, cuisine as well as how it impacts their information searching academically.

5.5.2 Librarian Interviews

Interviews were held with 6 librarians. All the librarians who were interviewed were either currently involved in providing information literacy instruction or had been involved in doing this in the past. The average in years of providing information literacy instruction was 5 years. Similar to the focus group discussions, the researcher used an inductive method to identify and categorize the comments made by the participants. The researcher used open coding as the main categorization strategy, identifying themes that were common across all the interviews. These categories or themes were then further examined to determine their relationship with multilingual information literacy and the objectives of the study as a whole. Themes that emerged from the librarian interviews centered on information literacy in general, as few had had significant MLIL encounters. However, these themes are still included here to show how the underlying principles of IL can be adapted in the MLIL instruction environment, just like they may be adapted to different subject specific areas. Recurrent themes from the interviews and their relevance to multilingual information literacy along with supporting quotes are discussed below:

IL Instruction & Teaching Preparation

In the general discussions regarding IL, the librarians touched on issues regarding preparation for IL instruction and library school; in a testament to how library services and library training has changed two of the librarians mentioned that when they went to library school (at least over 20 years ago) IL was not part of the curriculum, or the term as it's used today. Others mentioned that though they did not take a specific course in IL instruction, library school in general prepared them in different ways for what they do

now. Some of the responses regarding preparation & training for IL instruction work are given in the examples below:

> *Librarian 2: "No. I went to library school a long time ago and that was not in our curriculum"*

> *Librarian 4: Yes, I didn't take the course that they had at the time, **if** they had like an instructional course, and I didn't take collections either which I wish that I had I'm not sure, if it would have prepared me or not… I think it [library school] prepared me in different ways. … I think it prepared me for having to do multiple tasks at once that kind of thing because of the number of assignments that they pile on in the different courses….So I think in terms of like balancing your work, it prepared me but I did a co-op and I think the co-op experience prepared me more than the actual classes"*

Two of the librarians who had an educational background mentioned that their teaching background has certainly helped them in fulfilling their IL instruction duties.

> *"Absolutely, I, while I wasn't a full-time elementary school teacher, I did work part time in a school, so I know the environment of the school …and because I've had to write lesson plans and create units and be in the classroom, I was able to bring all of that information to bear in the early part of my career here."*

Some studies in LIS literature support library school preparation for teaching IL. O'Connor (2012) for instance, addresses some of the gaps that often exist between research / theory and practice in the series of articles she entitles "What they didn't tell me in library school" (p. 26-29). Specifically, in regard to multilingual information literacy, Kellsey (2003) suggests that in order to provide better and equitable access to meet the demands and diversity of academic library users multilingual information access issues should be addressed. She pointed out how difficult it is to find librarians with foreign language expertise and suggested that in addition to collaborative efforts such as interlibrary loan, this problem could be addressed in LIS education: LIS schools and libraries could "partner with academic departments to encourage undergraduate and

graduate students in targeted majors to consider librarianship as a potential career through work-study, internships, or practica." (p.392). At the least, LIS curricula could be designed so as to include courses that address multilingual information access and services. Other studies have suggested that whenever possible, especially for universities and colleges with large enrolments of international students, multilingual librarians could be hired (Jackson, 2005; Kumar & Suresh, 2000; Zhang, 2006). Liu (1995) suggests that a cross-cultural component could be part of library and information studies programs' curriculum to help librarians have better communication skills. Ishimura and Bartlett (2014) suggest continuing education for librarians in order to improve their skills. Other studies in LIS suggest specific topics that could be addressed e.g.: Sensitivity training for library staff on the topic of students' culture and language (Baron & Strout-Dapaz, 2001; Wang & Frank, 2002; Zhang, 2006). Other studies (e.g. Conteh-Morgan, 2002; Jackson, 2005) have advocated for knowledge of ESL practices and knowledge of the theories of second language acquisition as an important component to helping construct effective information literacy programs for ESL students.

Information Literacy & ACRL (Association for College & Research Libraries) standards

Many librarians rely on the ACRLs IL standards to guide their instruction and their goals regarding Information Literacy instruction services. Even though the standards have some translated versions e.g. in Farsi and Chinese, they do not directly address services to multilingual patrons. The author carried out the interviews in the spring 2014, when a new draft of the standards had just been released and when the University of Western

Ontario was getting ready to host the WILU (Workshop for Instruction in Library Use) conference. The topic on IL standards therefore was a recurrent theme in the interviews with the librarians. A general suggestion from the librarians centered on customizing the standards so they were more reflective of the Canadian situation and more aligned with the University of Western Ontario's libraries goals and objectives.

> *Librarian 3: I think information literacy standards are great. I think I find it's great for when you first start out on the job, because it gives you like something to start off with, right... I think for any group that considers themselves a professional, I think you do need to have standards. It's just – I don't know, something to be proud off, something to show that like this is what we strive for, this is what we believe in and do. Unfortunately the information literacy standards tend to not mean anything to people outside of the library world ...and Western [University] for instance, has its own set of standards that it goes by so we have to customize, we've dropped some terms of information literacy and are trying to map it to the university' s goals and focus…".*

> *Librarian 2:"I think standards are great but I think the past ACRL standards and even the new draft standards don't always take into account personal – the personality, the humanness of both learning and teaching, the complex nature of learning and teaching and the importance of relationships in teaching and learning and so I think some customization is always a good idea…"*

> *Librarian 2:"Here is my dream. I think that, as an Ontario educator, my dream would be that we would have some kind of information literacy standards that begin in elementary school, build in secondary and expand in post-secondary. So that there is somewhat seamless progression of learning information literacy critical evaluation skills and that kind of thing."*

In regard to MLIL, the Reference and User services Association (RUSA), a division of the ALA (American Library Association) does have some guidelines for the development and promotion of multilingual collections and services. The ACRL (Association for Colleges & Libraries) however, does not have any similar document to address the needs of multilingual patrons specifically within the framework of IL. Some studies in LIS

have echoed the idea of customization as expressed in some of the statements by the librarians that were interviewed in this study: Baron and Strout-Dapaz (2001), for instance, have suggested modifications to the ACRL's Information Literacy Competency Standards for Higher Education to account for the special needs of international students and ESL students.

Information Literacy Assessment

Another recurrent theme in the interviews with the librarians had to do with evaluation or IL assessment with the librarians mentioning that they did not yet have a formalized way of evaluating IL instruction. They all however indicated that they receive informal feedback from students and faculty from time to time.   Three also mentioned that the need to get more tangible feedback that could help them assess some outcomes and improve their services led them to establish a teaching squares" group. Members of the group attend each other's IL sessions and also meet as a group to discuss strategies for improvement. All librarians acknowledged the lack of time to cover all the topics in the one shot session and to be able to perform all the other duties they are required to perform.

> *Librarian 5: So we have to align our courses, adapt it with the university's goals and objectives, so you have to see, okay, for teacher learning what have you done to support this goal and objectives of the university*

> Librarian 3:*A good proper assessment is always hard to do, that's the thing that I would have to say librarians across the board struggle with like really good assessment tools. Honestly my success is spread word-of-mouth, so people like they see, they see well just a number of consults that I have, the number of classes that I do, faculty members saying things like this. Sometimes I do get official letters." [see below]*

Librarian 3: *I've received excellent feedback from faculty members telling me how valuable the class is like I actually have one here in my email that I can read for you – I just did that class yesterday. So she titled it subject thank you so much in caps and it's like hi --- I very much appreciate you taking the time today to speak to the students in the P-team 9528 so that was on critical appraisal of information. The coverage of the topic was perfect in caps and discussion of how they can use information while on placement and beyond very helpful for them. Thanks again, we are fortunate to have someone like you with your skill set and passion for the topic".*

Librarian 1: *I recently participated in sort of some informal assessment what did we call it – that's teaching squares.. .We modeled it after what they do in the teaching support center for faculty, they had, it's called teaching squares, where the faculty is sitting on each other's classes and then they meet and talk about it, really sort of informally like it's not necessarily feedback like, I think you could improve here, it's just more of just like, "Hey, I really liked what you did with, how you taught this or that kind of thing." So I found that really useful, that's why I sat in on, I think in three different librarian sessions.*

Though not always an accurate evaluation, two of the librarians mentioned that one way they get some form of assessments is through a quiz that is given to the students, in collaboration with the faculty:

"I would also have a quiz, too. Just something to test students' understanding of the module content, so they have to take it after they finish the module and it would be maybe 2% of the final grade. So the prof usually has to be in support of this, and that helps."

"...one or two in each of those libraries will work with a faculty member to create an assignment, and the assignment is librarian created and it's to test the information literacy knowledge and it is evaluated by the librarian and a mark assigned and that is-- then that can be used if everybody got 90% on your assignment, you can assume that you've done a good job or but here is the thing, thing is that teaching is an art and so that I don't always see the value in that assessment piece."

Assessments can also take the form of in-class evaluation forms given to the students by the librarians after IL sessions. Ishimura and Bartlett (2014) support some form of student

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input in assessment of the librarians and information literacy and suggest that this has potential of helping the librarian get much needed feedback on various issues such as topics and the librarians' teaching practice.

Collaborations

Collaborations with faculty were mentioned as a key component in facilitating the librarians' IL instruction duties. One of the librarians had an ongoing collaboration with faculty in the department she is assigned to where her IL instruction modules were embedded in several of the classes online. She described the IL instruction as self-paced, blended learning, whereby the students completed the modules at their own time and this minimized the time she had to appear in class for face to face instruction. The students could consult with her on an individual basis during her office hours and she could then offer one-on-one research help**:**

> *Librarian 5:"...It's self-based learning. They can just do it any time anywhere. It's also a blended learning approach, so I do go to the class, but just for like 10 minutes, 15 minutes each for three presentations, so I don't do like all these instructions anymore. So this basically has replaced in-person instructions we did in the past, but I still keep the in-person component which has – unlike the presentations, or doing lectures. I have some drop-in sessions at the library, so that students can come for research help any time during the period."*

All the librarians who were interviewed emphasized the importance of support from faculty, noting that this made their work easier and also students were likely to attend these sessions or complete any assignments/ assessments given if these were attached to their course work or given by the instructors. The librarians also mentioned that if the faculty were pro-library- this helped with the marketing/ promotion of library services

such as reference and instruction. However, some cautioned that initially one would have to market their services to faculty and students.

> Librarian 3: *"They (faculty) are very prolibrary. So some of the other ones that I know here on campus just start like they're just happy with the way life goes on and they don't really say much or contact their librarian or they don't want instruction. So – but the nature of my programs, they are very prolibrary, they tell their students all the time to come and see me and have me in their classes whenever they can when it makes sense for the most part."*

> Librarian 4: *"Part of it is don't give up trying to sell yourself first, like don't think that information literacy is just going to be handed to you. The opportunity to provide information literacy isn't going to be handed to you. So don't get upset when you don't get invited to a class, you got to work at it and sell yourself to try to get in there."*

Collaborations also helped the librarians in getting some constructive feedback to help them in knowing what to improve on or what topics they needed to cover. Additionally, some of the MLIL encounters that were mentioned by the librarians were initiated by faculty. In LIS literature, collaborations with faculty and other offices on campus are often noted as being key to establishing successful library services programs for international students and ESL students. These collaborations may take many forms: At Oregon State University, librarians and the International Cultural Services office collaborated to translate library guides into 14 different languages to address the needs of a growing international student population (Chau, 2003). Martin, Reaumme, Reeves and Wright (2011) report on a case study at the University of Toledo of collaborations between the librarians and the ESL instructors and how this resulted in a very positive impact on the development of a curriculum for ESL composition students.

Johnston & Marsh (2014) documented a case study where library staff were able to successfully embed information literacy curriculum into an English foundations course using iBooks and iPad apps. They further reported that this project allowed library staff to develop new technological skills such as using iBook Author and apps and has also provided opportunities for library staff to collaborate with faculty attend faculty meetings and play a more integrated role in the English foundations program.

In including the themes above, the author intends to show how these general IL themes can be applied to ESL students or students who may encounter language barriers in the online environment. These same themes are applicable to any other student population who share the same academic characteristics e.g. subject or major. The key is customizing them to whichever group is being served.

MLIL encounters

In the interviews, the librarians were asked if they had any multilingual information literacy encounters: examples of what they could include would be any reference /research help or IL instruction they had given to any student(s) that involved language issues. It could be a chat session, one- on-one in person appointments or formal IL sessions or library tours involving several students. Librarians were also asked if they thought LEP- Limited English Proficient students faced any language related challenges while searching for information, what these were and how they thought these could be addressed. 4 out of the 6 librarians who were interviewed had some encounters that they recalled and these are recounted below:

➢ One librarian who was proficient in *language x* [5] recounted a MLIL encounter where she offered IL instruction in *language x* at a department on campus where there was a significant enrolment of students who spoke *language x*. She had been invited by faculty to provide instruction and address certain topics including plagiarism. The librarian not only provided the instruction but also provided the students with referrals of where they could seek other help on campus e.g. the international students and scholars' office. She also encouraged them to seek research help from the librarians as she noticed many were hesitant to do so. The librarian mentioned however 2 challenges that she encountered, one had to do with the fact that she was attached to a different department/library and was not part of the librarians attached to this faculty. The other issue at hand was whether it was the right thing to offer IL instruction in *language x* and if this would be going against the learning objectives of the university since it's an English speaking institution. She also mentioned that though she eventually gave the instruction in *language x,* she still used English for some of the library jargon as she did not know what the *language x* versions of these terms were. Some of the dilemma she faced is reflected in her statements below:

"....the library director of L library[6] at that time didn't feel it was too appropriate because first of all, they[students] should be contacting the L library and also even if I'm the person to give the instruction– that's where I should be speaking in English, because we are an English institution. So that was a little bit controversial there. And then when I was there, I started speaking English because I felt that was the right thing to do. There was kind of a political issue going on there, so I started speaking in English and then the students were like,

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[5] In order to protect the identity and privacy of the librarian, the language is referred to here as "language x" and "language y".

[6] In order to protect the identity of the librarian(s) involved, the library in question is referred to here as "L library."

come on, we thought you are going to speak in language x. That's why we are here, that's what we were told- that you are going to speak in language x. I said, okay, alright, I'm going to switch channel. So that's how that happened."

"Like I will love to use language x in that session but just because there are some controversies going on, but then the students actually requested that, so I ended up using language x, but interesting thing for me is that because I received all my post-secondary education in English speaking environment, for some jargons I don't even know like the language x terms to be honest like the library jargons or some jargons like I can't think of an example now. So I ended up using some English terms in the midst of my language x lecture. So it's not purely language x and I had to use some English terms. And I think it's good for students to learn those terms, because they are going to --....."

This librarian also mentioned that another instructor from this faculty contacted her on another occasion to find out if she could do something similar for *language y*[7] students or if she knew another librarian who could do it. Examples are documented in LIS literature where IL instruction was given in students' native languages, with some positive results. Bosch and Molteni, (2012) for instance, reported on their experience providing bilingual IL instruction at the California State University, Long Beach (CSULB) and the California State University – Dominguez Hills where they were able to at least do some code-switching between English and Spanish. The code-switching was also used by the students when they wanted to ask questions, such that they could do it in either language. The librarians reported that this was tremendously welcomed by the students and it certainly made them more at ease and more enthusiastic about IL. They concluded that providing IL in students' native language had some positive outcomes including: creating a culture of inclusiveness, enhancing student-library connections, promoting a better understanding of library services as well as improving information literacy skills and reducing library anxiety.

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[7] See footnote 4.

➢ The other encounters involved exchange students in the faculty of law. A librarian attached to the faculty mentioned that in addition to language issues, the exchange students faced difficulties due differences between the Canadian legal system (Common law) and that of their native countries. She also expressed concern with the inaccuracies inherent in machine translation noting that this would be especially problematic for an area such as law where wording and accuracy play an important role. Two solutions she mentioned that have helped in working with exchange students were creating online modules and using the Canadian Association of Law Libraries' Listserv:

"....you're looking at language here and you have students from countries where English isn't their first language and they're not familiar with legal citation. Having something online that they can go through at their own pace would certainly help."

"Quick law will usually have the French translation [of a case] if it's out there. Things like the Supreme Court decisions are available in French and English. But we're also on, I'm on a listserv for the Canadian Association of Law Libraries and that's one of the questions that comes up on there from time to time...like does anyone have an English translation of this Quebec case?"

➢ Another librarian mentioned that she was involved with a bridging program that was done in collaboration with the international students' office. This involved events during orientation week, including a customized library tour for international students and also some specialized IL sessions for ESL students during the term.

➢ Another librarian who was involved in providing IL instruction and reference services for the newly established English Learning Institute. She said talks were

on going with the faculty there for her to provide specialized information literacy instruction but nothing had been formalized yet.

Summary

The topics that were covered extensively in the librarian interviews were centered on information literacy. The language issues were brought into the discussion by the researcher, bearing testament to the finding that 5 of the 6 librarians who were interviewed had not encountered any multilingual information literacy related incidences in their work and were for the most part unaware of the unique needs that are characteristic of this student population.

5.6 Discussion: Convergences and divergences in librarian and student perspectives

As can be seen from the examples given below, there was no consensus among the students on the topics that need to be covered in IL sessions. However, the statements from both the students and librarians underscored the fact that the students might have varying levels of information literacy skills as well as varying levels of English language proficiency. This would seem to suggest that personalized information literacy instruction models where the students can learn at their own pace may be an effective way of reaching these students. Additionally, an initial needs assessment to find out what topics the students would like to be covered or to determine their IL skills level could also be helpful in designing the lessons for different groups of students.

> Student participant 1*: "I noticed here that the librarians at least at x, my home college, they're very fond of ref works. ... I just find that so ridiculous. It's the stupidest thing ever. Why would I, I can just do it in Summon I can click save, do the ref there, and just paste it into my essay. I've seen like at x they[librarians] all*

said that ref works is this great tool. I just find it's another step that you have to take which is stupid because you can just get it on Summon."

Student participant 2: "*... I have attended a few of this mandatory information literacy, how to search classes because they are mandatory in European universities where I studied and I found them extremely boring. Most of the people I was in the class with actually already knew what was to be done. Like you use the double quotes, separate search stops, I mean that's the thing that you need a class to be taught and it's almost so intuitive that I find that if it has to be made mandatory half of the people lose because they know they can get by. So I think for a class like this to be successful, what results the students can get from attending a session like that should be highlighted, because then you can ask for people to come and tell them, 'If you come, you will learn this...' Rather than teach you double quotes around searches, yeah sure, we know that*"

Student participant 3: "*I think that it can also be made project specific, for the major courses.*"

Librarian 2: "*You don't know what their base knowledge is and that like I was saying earlier, so then you teach to the middle, not too simplistic, but you are not going into all of the advanced searching either. So you are teaching to the middle, and sometimes that – even after all these years of teaching, you sometimes, as an instructor, you sometimes miss the mark on that. So, if I am teaching to the middle in a class where it was way too simplistic, then the feedback is going to be well, that was great, but why didn't you teach us about this and that. And one person blew me away, I did the middle basic kind of instruction and the student said, what I really wanted to know about was how to get impact factor for journals, and it's like okay, wow, that's not in my introductory hour.*"

These differences in IL skills and language proficiencies may also call for a different skill set from the librarian or at least an adjustment in the librarians' approaches in teaching. As Ishimura and Bartlett, (2014) point out: "Students' level of study may require that librarians have different skill sets in order to work with them effectively. For example, generally speaking, graduate students require more advanced research skills and tend to have higher English proficiency." (p.320).

Another area of convergence between students and librarians' perspectives would seem to point towards making *some* IL sessions mandatory. The key word here is some, which should be determined after a *needs assessment*. Sessions covering topics in MLIL may be necessary for first year ESL students while for some first year international students these may not be necessary at all.

> Student participant*: "I didn't have a clue about any [IL classes]; like honestly 6 months ago. Because I don't do a lot of research, but I could have done a lot of research I guess, if I knew. Especially what I get from the other students, it's usually not allowed research but it's useful resources which you could use in a lot of other things you want to do. Additional, trying to be efficient I guess but there should be, I mean there should be, some mandatory I think, mandatory one class a year, where you have to come and they tell you, it might be boring but at the end of the day, even if you take 10% of that it would be helpful, really helpful."*

> Librarian 2: *"My very first thought was the mandatory courses, so that I can't argue for and against mandatory courses. I think that they would have to be delivered, they would have to be very, very carefully thought out and very carefully integrated with the curriculum and the programs and that kind of thing."*

> Librarian 5*: "I always appreciate it when the instructor is there, that's always nice or if they* **take attendance** *that's always appreciated too because you know at least like those students are getting some credit for being there."* (Emphasis added).

On the overall, there seems to be convergence on key issues or principles about information literacy: The discussion around whether information literacy instruction should be mandatory or not seems to point towards an acknowledgement by both librarians and students that some form of information literacy instruction is helpful in promoting students' learning and achievement. The divergences in regard to information literacy are mainly related to the topics that should be covered in the IL sessions. Clearly,

this is an area where divergences are going to exist even amongst Canadian students or English- proficient students and is not unique to the international and/or ESL student population as all students will often have different skill levels in IL. With international and ESL students, however, these differences are accentuated by differences in linguistic and cultural backgrounds, as well as differences in educational and library systems they have been previously exposed to. Blau, Hall and Sparks (2002) observe that international students / non-native English speakers are a heterogeneous group and therefore those dealing with them should guard against excessive generalizations and assumptions as this will hinder the creation of a successful learning environment and neglect individual needs. Furthermore, students don't always know what IL instruction entails, or what IL competencies they are required to have. It is important that librarians collaborate with the faculty to make sure that these competencies are clearly communicated to them, while also emphasizing their usefulness. More studies examining the connection between student academic success and information literacy instruction, (see for instance, Bowles-Terry, 2012) would help in solidifying the case for IL instruction especially to faculty and university administrations. The newly revised ACRL "Standards for Libraries in Higher Education" seem to also support this approach as they include an outcomes-based approach that articulates "expectations for library contributions to institutional effectiveness". As is further discussed in the conclusion, other proposed solutions include beginning with a needs assessment and then offering specialized information literacy instruction and /or personalized information literacy instruction. Specialized information literacy instruction could be delivered in person to groups of students from different departments or facilitated through online video tutorials on the library website.

Personalized information literacy instruction could be given through one-on-one consultations with individual students or through online modules or video tutorials. Other studies in LIS have also supported specialized information literacy for international students: Baron & Strout-Dapaz (2001), for instance, point out that library instruction specifically for international students is effective when factors such as different communication norms and educational systems are taken into consideration and when also done in collaboration with teachers of ESL.

In regard to multilingualism and its relation to information literacy, the main divergence in this study seems to be simply that while language issues seemed to be central in the focus group discussions, they seemed to take a back burner in the interviews with librarians. While this was not surprising at all, it was not by design. A number of librarians who were invited to participate in the study actually declined on the basis that they didn't have any "significant information" to contribute to the issue of multilingualism and how it impacts information literacy. It is worth pointing out too that multilingual information literacy is not widely discussed in LIS literature as yet. Though a good number of studies have covered issues relating to ESL students and international students and their use of libraries- practically speaking, many librarians have not had to deal with these issues in their work environment. This is because in many cases the onus is placed on the library users to improve their language proficiency (primarily in English). This study however aims to challenge this long accepted view and raise the questions- is there a role that LIS professionals can play in helping reduce language barriers? Is there a role that IR system designers could play? A lack of awareness of solutions that exist to combat language barriers to information access both by the students

and librarians seems to be evident. Studies such as this one could help promote awareness of solutions such as the use of MLIA tools or MLIL in general. There seems to be a misconception too, that MLIL instruction is offering IL instruction in multiple languages or at the least in another language in addition to English. While this is a key aspect of MLIL instruction, it certainly is not the *only* aspect and this misconception only serves to promote the mindset mentioned earlier that international/ESL students are a problem/ challenging student population, and also makes librarians who do not speak other languages in addition to English feel they are not qualified to provide services for this student population. However, as a starting point, in order to effectively serve this student population, the author concurs with what other studies have proposed i.e. creating a position that would serve as library liaison to international students, and help coordinate efforts to reach this student population. Such a librarian would be responsible for, among other duties, international /ESL student outreach and instruction, but also help in creating awareness of some of the unique needs of this student population. As Kumar and Suresh (2000) state: "Having one contact person who… is perceived as approachable and interested in [international students] will go a long way towards improving communication, and building a positive relationship between the library and the international student body" (p.333).

5.7 Conclusion

The current study explored bi/multilingual students' and librarians' perspectives of multilingual information literacy in the context of a large Canadian university. However, the findings and results could be relevant to other higher education institutions worldwide. The study sheds light on some of the linguistic related challenges that

students face while searching for information e.g. not finding the right keywords, and not understanding the information they retrieve. The students also lacked awareness of some of the services the library offers e.g. IL instruction. Though they were familiar with some MLIA tools, such as machine translation, the students were unaware of some of the other MLIA tools that could be beneficial to them, such as cross language information retrieval. The librarians on their part were unaware of the linguistic related challenges that these students face, and were also unaware of or underestimated the role they could play in alleviating some of these problems. In regard to the role that LIS professionals could play in enhancing multilingual information literacy, Valentine (2008) asks this poignant question: *"Librarians and educators like to talk the user-friendly talk, but do they walk the user-friendly walk when it comes to providing services for someone who is less than fluent in English?"(p.199).* The examples that have been given in the previous section would seem to imply that in recent times, with increased enrollment of international students on campuses in the US and in Canada, educators and librarians are indeed beginning to pay attention to these issues. However, in the light of the constantly changing landscape of information explosion and technological advancements, these efforts need to be intensified and constantly reviewed. Increased collaborations on campuses, between universities and internationally through different LIS associations and organizations could also go a long way in promoting multilingual information literacy.

Some studies have shown that IT skills among international students are much less of a problem than their language and communication problems (Hurley, Hegartey & Bolger, 2006; Hughes, 2010). Even though the findings of the current study did not reveal significant limited English proficiencies amongst the student participants, the study

revealed a lack of advanced MLIL skills that could help alleviate some of the linguistic related challenges that these students face in the online environment. Given that the average experience for using the internet in the sample was 11years while that of using electronic databases was 6years, the author suggests building on these IT skills and interests and pursuing an individualized form of information literacy instruction. These IL lessons could emphasize among other topics the use of MLIA tools, so the students are aware of them. The current study did reveal a number of language related problem areas where the proper use of MLIA tools could prove remedial: translations from their native language into English could be alleviated somewhat through machine translation while issues with terminology or poor choice of keywords could be alleviated through the use of CLIR (Cross-language Information Retrieval) and multilingual thesauri. Difficulties in interpreting the bibliographic record or information on the library website (as was echoed by one participant in this study) could be alleviated through the use of multilingual interfaces. The pragmatic role of MLIA tools is emphasized here to further highlight the importance of user-centered design and the role that IR system designers could play in increasing MLIA tools on their platforms, or in improving the functionality of already existing MLIA tools such as machine translation.

This study and the earlier two phases leading to it revealed the diversity that exists in this student population. Other studies have also highlighted this observation, thereby urging librarians not to stereotype international students "as if they are all from the same county, share the same cultural and linguistic background, and face more or less the same challenges in using the library" (Ye, 2009, p. 8). In order to find out where to concentrate their efforts and also find out how to improve library services, individual

libraries need to frequently carry out needs assessments of the various student populations they serve, including international students . At the research level, studies that make use of methods such as phenomenology (see for example, Johnston, Partridge & Hughes, 2014), which emphasizes the qualitatively different ways a phenomenon is experienced in the world around us- would enhance and increase our understanding of the information searching behavior of different users.

5.7.1 Practical implications and future research

In view of the foregoing, the author also advocates for SILI (Specialized Information Literacy Instruction) for this user group especially in situations where there is enough students to attend information literacy classes that are geared towards limited English proficient speakers or non-native English speakers in general. Specialized instruction could also be organized according to the native countries of the students or according to a common language they speak. If the number of students is too few to make this option viable, PILI (Personalized Information Literacy Instruction) could be the next option to consider. In her study that surveyed librarians and their services for international students, Bordonaro (2013) found that some of the librarians were engaged in various kinds of support for international students. Some of these were language related, and took the form of *individualized* library research help offered either in the librarian's office or at the reference desk. PILI is certainly also a viable option in situations where the lessons can be integrated in a class module and completed by the student in their own time.

The solutions suggested here- needs assessment, SILI and PILI are already a part of many IL instruction programs, but usually pertain to other student groups e.g. by department or

subject area. In the case of PILI, all the librarians the author interviewed were already

engaged in some form of individualized information literacy instruction which they often

referred to as "research help". One of the interviewees also mentioned a class where she

has embedded her IL modules and students complete these in their own time. This could

certainly be done as well for ESL students in collaboration with ESL faculty. Online

tutorials that deal with some topics pertaining to MLIL could also be made available on

the library website and advertised during orientation sessions or through the international

students' office.

One librarian in this study recommended that in general, information literacy instruction

should start much earlier, at the high school level. This mirrors similar suggestions from

other studies (Mertes, 2014; Loertscher, 2014). In the case of international students,

perhaps including an IL session in their orientation sessions offered *before* they arrive in

their host countries could be helpful: this earlier session(s) would provide several

advantages: 1. It can be customized to suit previous experiences and skills already

acquired in their native countries, and 2. These students would probably have one

language in common and some of the sessions could therefore be offered in this language

or code switching could be used effectively in this case. 3. The one shot session they are

offered once they arrive on campus would not be too overwhelming as they would be

facing a follow up session from the first session done back in their home countries

instead. The author intends to carry out a follow up study- that would involve one or two

case studies of IL being offered to international students in their native countries before

they arrive in their host countries. These sessions could be/ may be facilitated through the

educational attaché of the consulates or embassies of the countries that are potential hosts

of significant numbers of international students. It is assumed that such a group might share similar experiences e.g. past library use, technology skills and more importantly a similar language, making it much easier to customize such a session and provide specialized information literacy instruction. This would ensure that these students receive some form of specialized information literacy instruction, which is not always possible especially if they end up at a university that does not have a large enrollment of international students. Arguably, even for those universities that have large enrollments of international students, these students often come from different countries and there would also be a diversity of languages represented.

A recent issue of *Feliciter,* (a publication of the Canadian Library Association (CLA)) focused on international activities of Canadian librarians. In this issue, a wide range of examples are covered with librarians sharing activities they are involved in including a librarian who was involved in a medical library partnership program in Ethiopia, and another who related her experiences working on a project with a university library in Tanzania. There were also examples of international initiatives that were being carried out nationally in Canada, such as those of a librarian who offers information and advice about setting up international programs in Canadian university libraries. Another article dealt with the broader issues surrounding international librarianship by asking the very important question, "What can we do here in Canada?" and gives practical examples of what librarians can do to be engaged in international issues. These articles inspired the author to begin thinking about future research and some practical implications regarding multilingual information literacy. Some actions could involve investigating collaborations with international LIS (Library & Information Science) organizations such

as IFLA (International Federation of Library Associations and Institutions) and LWB (Librarians without Borders). At national levels, both in Canada and the US, interest groups in various LIS organizations exist that could be involved in raising awareness regarding international information literacy issues. Examples include: Special Interest Groups such as the International Information Issues within ASIS&T (Association for Information Science & Technology), the international relations office and the international relations round table within the ALA (American Library Association), and the International Library Education and the Multicultural, Ethnic & Humanistic Concerns within ALISE (Association for Library & Information Science Education). The ACRL (Association for College & Research Libraries) and the CLA (Canadian Library Association) also have members who are interested international librarianship. Dissemination and sharing of ideas on MLIL and other issues pertaining to international librarianship could be facilitated through these groups. Members could also volunteer as virtual international librarians and provide online SILI or PILI sessions.

In conclusion, it is perhaps expedient to make the distinction between being *multilingually* information literate, and being multilingual information literate. With the former, one would of necessity have to be multilingual whereas with the latter it is possible for one to possess this quality without being necessarily multilingual or even bilingual. A multilingual information literate person could therefore be defined as someone who is able to find, read, evaluate and use information regardless of what language it is written in. It is possible especially for English speakers to possess the qualities of an information literate person (mentioned on p. 142) in English and other languages as long as they also have a familiarity with the use of multilingual information

access tools such as machine translation and cross language information retrieval (CLIR). This is possible with other select language pairs as well, but English is singled out here because of the reasons that have been mentioned in this paper such as availability of resources in English, and availability of MLIA tools that focus on English. For instance, while many bilingual dictionaries exist, the majority will always have English as one of the languages. This scenario will therefore sometimes create a situation where English acts as a pivot language in machine translation. This article also seeks to move towards an expansion of the definitions of multilingual information literacy which in the past have tended to emphasize a provision of resources or services in multiple languages: while this is a key factor in MLIL, it is not effective on its own in alleviating language barriers. Instead, we should also emphasize more translation tools and access of information *across* languages. MLIA tools such as machine translation and cross language information retrieval are key to achieving this goal. In regard to MLIL instruction, we need to move from just providing IL in multiple languages to instructing users on how to access information across languages or in multiple languages without necessarily having knowledge of all these languages. In the same way that academic librarians are able to provide multidisciplinary information literacy instruction without necessarily having a background in all the subject areas they work in; they are also capable of providing MLIL without being multilingual or bilingual in all the languages represented among ESL students or international students.

 In sum, it is possible for us to celebrate and embrace our language differences while also eliminating the barriers. This can be done if we develop more cross language or translation tools while improving their quality instead of developing resources in multiple

languages in isolation or simply putting the onus on information users to learn more languages. Multilingual information literacy is a skill-quality that should be desired by every LIS professional and especially those who serve multicultural -multilingual populations. As the world becomes more and more multilingual and multicultural, it is indeed a skill or quality that could be beneficial for all individuals.

5.8 References

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CHAPTER SIX
6.0 Conclusion, contributions and future research

6.1   Introduction

The three studies discussed in this dissertation provided an in depth investigation of the information searching behavior of bi/multilingual academic users.   As generalization of information searching behavior is often difficult to achieve due to the many differences across individual users, the studies did not aim at generating a theory of information searching behavior or generating one appropriate model for representing the information searching behavior of bi/multilingual academic users. Rather, the studies were largely exploratory and aimed at contextualizing the information searching actions and interactions in the multilingual information retrieval environment from the user perspective. Specifically, the studies sought to describe the user experience and identify (rather than test) the factors that influence the users' searching behavior in multilingual environments where Multilingual Information Access (MLIA) tools are available. The research also sought to concretize the concept of MLIL (Multilingual Information Literacy) and identify the role that different stakeholders such as IR system designers and LIS professionals could play in enhancing and promoting multilingual information literacy. Despite this lack of generalization, the studies attained a measure of success in achieving these goals, while also laying the groundwork for future research in the area of multilingual information access. The results, while not generalizable, are certainly transferable to similar environments and with similar user groups i.e. bi/multilingual students at large University settings in the North American context.

The three separate studies, though using different methods, were all aimed at exploring the information searching behavior of bi/multilingual students with a specific emphasis on their use of MLIA tools. The different phases also aimed at highlighting the different roles played by the user, IR system designers and LIS professionals. The first phase focused on the user- their choices and actions; the linguistic related challenges they faced, and the coping mechanisms they employed while searching for information on the internet and in electronic databases. The second phase aimed at capturing actual use of MLIA tools on two systems namely Google and WorldCat, and by means of a post experiment questionnaire, obtaining the participants' evaluations of these tools. This stage sought to capture tangible data to support recommendations for the user-centered design of MLIR systems. For example, information pertaining to the kind of language support needed for specific stages in the IR process. This phase thus emphasized the role of MLIR system designers. The third phase aimed at identifying the role of LIS professionals in providing information literacy instruction to this specific user-group.

6.2. Discussion

This section revisits the research questions of the study, and discusses how the findings and implications relate to these questions.

1) What role do linguistic determinants play in information seeking on the web and on select electronic databases?
> *a) Do bi-/multilingual speakers use other languages (apart from English) while searching for information on the web and in electronic databases?*
> *b) What are their language choices and considerations in their query formulation?*

a) The study found that bi/multilingual speakers use other languages while searching for information on the web but mostly used English only while searching for information in

electronic databases: Data from the web survey responses showed that 67.6% used other languages apart from English while searching the internet and electronic databases. 73.2% indicated they used *both* English and their native language for searching the internet. By contrast, 67.2% indicated they used *only English* in formulating search terms on electronic databases.

b) Chi square tests done to test for relationships between different variables during the experiment phase revealed a significant relationship between use of MLIA tools and the language the task was stated in. The tests showed that participants were more likely to use MLIA tools when the language in which the task was stated was their native language, however MLIA tools were used less when the language the task was stated in was English, implying that participants derived their keywords from the task instructions and entered them in English. A possible explanation could be that students did not know how to translate the keywords into English keywords when the task was stated in their native language. This corroborates findings from other studies (e.g. Johnston, Partridge & Hughes, 2014) that revealed that EFL (English as a Foreign Language) students had a preference for translating from English to their native language but experienced many barriers when they had to translate information from their own language to English.

2) *How much are bilingual/multilingual system users aware of and in the habit of using multilingual information access tools available in electronic databases and search engines?*

 Results for this question revealed that while the participants were aware of some MLIA tools such as machine translation they were unaware of others that could help them especially at the query formulation stage; such as CLIR search options and multilingual

thesauri. This lack of awareness could be attributed in part to a lack of their availability on some electronic databases. After being introduced to these tools e.g. limit by language and CLIR, 86.7% of the participants used these tools while performing the experiment tasks. Moreover, on the post experiment questionnaire, participants were asked to indicate what tools they had used in the past and what tools they would likely use again in the future: some of the tools such as multilingual interface and virtual keyboard had over 50% increase from past use to future use. In the comments section on the post experiment questionnaire as well as during the focus group discussions, a number of the participants did mention that they were not aware of the CLIR tool before and that they intended to use it in the future now that they were aware of it.

3) How does the availability and use of multilingual information access tools affect the information searching behavior of bi/multilingual academic users?

Results from the experiment phase revealed a significant relationship between the use of MLIA tools and the search language: students were more likely to use MLIA tools when they used both English and their native languages to conduct their search, than when they used *English only.* In light of the findings in 1 above (i.e. that students use other languages apart from English while searching for information online), it can be surmised that they would likely use MLIA tools in some of these search sessions. The findings in 2 above, regarding students' intention to use MLIA tools in the future also mirrored results from the post experiment questionnaire, where 60% indicated that they preferred a search *with MLIA* tools, while 30% had no preference and only 10% preferred a search *without MLIA* tools.

An independent-samples t-test that was conducted on the experiment captures also revealed a significant difference in the time spent for when MLIA tools were used and when MLIA tools were NOT used. Though this could be applicable mainly for students with low to moderate English proficiency levels, these results suggest that students spent *less* time on the task when they used MLIA tools. Possible explanations for this time difference point towards ways in which using MLIA tools could save time e.g. changing the language interface could help them know how/where to enter their terms and how to apply additional limitations; using CLIR searches could save time otherwise spent on trying to translate the terms before entering them in and finally, using MLIA tools could help them understand and interpret the results retrieved better and faster.

4) How well do current MLIR (Multilingual Information Retrieval) systems (e.g. search engines and electronic databases) meet the expectations and needs of bi/ multilingual academic users?

In general, the study revealed a lack of awareness of the availability of MLIA tools on WorldCat, and other electronic databases, while most were aware of at least machine translation on Google. In regard to machine translation, participants' main complaints had to do with the inaccuracies inherent in machine translation. However, they also noted it was better to have it than not have it at all. Particular aspects they appreciated on Google's MLIA tool *Google Translate* included: the ability to translate a whole webpage, the pronunciation feature, the virtual keyboard and the "suggest a translation" feature. After being introduced to more MLIA tools, the participants expressed a desire to have more MLIA tools available on electronic databases and for these to be seamlessly integrated for easy access.

5) What are the perspectives of current academic librarians, and students regarding how to address the linguistic related challenges that bi/multilingual users face while searching for information online?

Most of the librarians who were interviewed in the study were not aware of the language challenges that this group of users faced while searching for information online. This was not surprising at all, since in the North American context, the onus is often placed on the user to learn English, and in the case of international students, they're often required to provide proof of English language proficiency as an admission requirement to most higher education institutions. The students lacked awareness of the availability of some MLIA tools (particularly in electronic databases) and how these could be instrumental in addressing their linguistic related challenges in online information environment. The students equally lacked awareness of some of the services that the library could provide for them. In particular, they were not aware of information literacy instruction services and their usefulness, with some admitting that they thought these classes were "boring" and/or that they would not learn anything new from the classes. Some however acknowledged that they could benefit from these classes, but expressed the desire to know ahead of time what topics would be covered. Students' opinions on what topics they wanted to see covered in these classes varied; leading the researcher to conclude that personalized information literacy instruction through online video tutorials, or embedded modules on their course sites might be a good way to provide this instruction.

6.3   Recommendations

In view of the findings of the three studies, user-centered/participatory design, user-modeling and user-centered evaluations of MLIR systems are recommended. Specifically in regard to MLIR, given the diversity of the characteristics of bi/multilingual users,

Personalized Multilingual Information Retrieval (PMLIR) models (e.g. Ghorab, Zhou, Steichen &Wade, 2011) that would take into consideration users' past browsing patterns, language proficiencies, as well as domain knowledge and interests would seem to hold great potential for representing the information searching behavior of these users. In regard to MLIA tools, implications and recommendations for IR system designers seem to point towards increasing the availability of MLIA tools especially in electronic databases and/or an improvement in their functionality e.g. improvements in the accuracy of machine translation. Given that some of these databases access non-English collections, CLIR search options or support for multilingual queries would be useful. There's also need for these tools to be seamlessly integrated so they are easy to find and use, and not built on complicated advanced search protocols which are not easily accessible especially for a novice searcher. It would also be helpful for the databases to mention in their help sections the extent of their coverage of multilingual materials. In regard to abstracting and indexing, providing multilingual thesauri and abstracts in more than one language would greatly enhance the user's understanding of the record's bibliographic information and in turn aid their ability to assess the relevance of the documents retrieved. Machine translation could also be made available to users to help in understanding the documents they retrieve. This should also be easily accessible and not require an administrator to enable it or for the user to exit the database in order to access a translation service which may sometimes be costly.

In regard to multilingual information literacy, LIS professionals can play a role in making students aware of the MLIA tools available to them on the internet and on electronic databases. Considering the diversity and unique needs of this student population(s);

Personalized Information Literacy Instruction (PILI) and Specialized Information Literacy Instruction (SILI) such as providing IL instruction in multiple languages would seem to be suitable models of teaching information literacy skills to this user group. Other recommendations, which have also been suggested by other studies would include providing access to non- English material (Knight, 2010; Mundava & Gray, 2008) as well as addressing this need through library school curriculum and including courses dealing with language and information. Professional development seminars organized through LIS associations and organizations could also be used to train staff on special topics such as MLIA or services to multilingual/ multicultural patrons. Having bi/multilingual librarians on staff could be useful (Jackson 2005; Kumar and Suresh 2000; Zhang 2006). However, since this is not always feasible, at least having a liaison librarian for international students and/ or ESL students is an option that has been proposed by some previous studies, and is a current practice especially in universities that have large enrollments of international students. Such a position would be responsible for, among other duties, international /ESL student outreach and instruction, but also help in creating awareness of some of the unique needs of this student population.

6.4.   Contributions of the study

In seeking to gain a deeper understanding of the information searching behavior of bi\multilingual academic users, this research contributes to three areas of research in the field of Library and Information Science: 1) Design/ development of Multilingual Information Retrieval systems. 2) Theories/models of information seeking behavior and 3) Web usability/ information services for bi/multilingual users.

While using real users or potential users of MLIA tools, the study highlighted practical application domains where MLIR technologies can be employed, thus helping motivate the need for further developments in MLIR. The current study enhanced other user studies in MLIR and contributes to the subfield of multilingual information access by considering perspectives from bi/multilingual users from different linguistic backgrounds. Some studies have focused on one specific language- e.g. Chinese (Chung et al 2004); Spanish (Chung, 2006); Persian (Aytac, 2005); Portuguese (Orengo, 2004); Korean (Rieh & Rieh, 2005) or a group of related languages e.g. Chinese, Korean, Japanese (Ha, 2011). While focusing on one language has its own advantages such as keeping the study manageable, in the current study, having participants from diverse linguistic backgrounds helped reinforce the need for developing resources that provide access *across* languages and not just resources that focus on each individual language in isolation. This first phase of the study revealed that though advancements in NLP such as machine translation have helped ease some of the language barriers in the online information environment, users still face a number of challenges at the query formulation stage and in assessing the relevance of documents retrieved. This finding was applicable even for participants who are proficient in languages that have a considerable presence in the online environment.

The second phase of the current study provided an opportunity to evaluate already existing MLIR technologies from a user-centered perspective. While there have been other studies that have involved user-centered evaluations of MLIA tools; most have focused on one aspect. Examples here include: Studies that have focused on Cross language (CLIR) search options (Petrelli et al, 2004; Airio,2007; Capstick et al, 2000);

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machine translation (Dolamic, 2010; Rosemblat, Gemoets, Browne & Tse , 2003); multilingual interfaces (Ruecker, Shiri & Fiorentino, 2012; Shiri et al, 2011);bi/multilingual dictionaries (Hull & Grefenstette,1996; Pirkola, Hedlund, T Keskustalo, & Järvelin, 2001;) and multilingual thesauri (Nykiri, 2010; Jorna & Davies, 2001, Shiri et al, 2011). The current study builds on these previous studies by examining several MLIA tools , while also providing an opportunity for the participants to gain awareness of some of the lesser utilized tools such as CLIR and virtual keyboards.

The third phase of this study, discussed in chapter 5 seeks to move towards an expansion of the definitions of multilingual information literacy which in the past have tended to emphasize a provision of resources or services in multiple languages (see for instance Horton, 2013): while this is a key factor in MLIL, it is not effective on its own in alleviating language barriers. Instead, an emphasis on translation tools and access of information *across* languages is needed. MLIA tools such as machine translation and cross language information retrieval are key to achieving this goal. Findings from this phase also provided another practical implication of the study i.e. adapting user-centered models for providing services for this user group. The study found that Specialized Information Literacy Instruction (SILI) and Personalized Information Literacy Instruction (PILI) could be suitable models for teaching information literacy and library skills for bi/multilingual academic users. Thus, the study also builds on and enhances other studies done in this area that discussed the importance of providing multilingual library instruction (Bosch & Molteni, 2011; Chakraborty & Tunon 2000; Jackson, 2005; Liestman & Wu, 1990; Liu & Winn, 2009; Puente, Gray & Agnew, 2009; Spanfelner, 1991.) The current study argues that while this is useful, it is prohibitive in the sense that

it is not always possible to have bi/multilingual librarians on staff and it is also not possible to have a librarian who has knowledge of all the languages represented in an ESL class or among international students. The study advocates instead for a model that emphasizes instructing users on how to access information *across* languages or in multiple languages without necessarily having knowledge of all these languages.

6.5   Future research

While generalizations may not be possible for most user- centered studies in information seeking, user-centered studies are valuable in providing tangible data for the effective development of MLIR systems: replications of this study could therefore be done by changing certain aspects such as languages used, subject domain of the tasks or the study populations. Additionally, longitudinal studies and studies employing unobtrusive methods of observation, or log analyses of searches already done by real users on MLIR systems would provide a useful comparison with the current study while also presenting other opportunities in terms of the amount and variability of data and users studied. Future research that involves lab-based evaluations of MLIA tools could also be valuable in examining the real impact of these tools on other factors such us retrieval effectiveness and thus lead to improvements in the functionality of these tools.

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Appendix A

Web survey instruments

Recruitment E-mail

Dear Western University Student:

You are being invited to participate in a study exploring the use of Multilingual Information Access (MLIA) tools in online searching by Bi/multilingual academic users. The findings of this study could contribute towards informing system designers in developing Multilingual Information Retrieval (MLIR) technologies. The study will also provide an opportunity to evaluate the effectiveness of already existing MLIR technologies. Additionally, the study could also provide valuable information to LIS (Library and Information Science) professionals on how to design services-e.g. information literacy classes for this specific user- group- i.e. bi/multilingual academic users.

We are asking you to take part in this study because we think you might be interested in this topic. To participate in this study you need to be over 16 years of age, be a non-native English speaker OR a bilingual/ multilingual speaker of at least one other language in addition to English. Your completion of the web survey will be considered as evidence of your consent to participate in the study. While there's no compensation for completing the web survey, compensation in form of a $20 gift card will be given to those who choose to *also* participate in the experiment or the Focus Group discussions.

The web survey takes about 10-15 minutes to complete and is to be completed anonymously. No self-identifying data is required from you and your responses will be treated with the strictest confidence. There are no known risks or benefits to your participation in this study. Participation in this study is entirely voluntary; you may refuse to participate, refuse to answer any questions or withdraw from the study at any time you wish to do so.

If you have any questions about this study, please contact me (contact information below). If you have questions about your rights as a study participant, you may contact: *The Office of Research Ethics, Western University, at 519-661-3036 or by e-mail at ethics@uwo.ca.*

If you would like to participate in this study please click here to access the letter of information and survey link.

Sincerely,

Peggy Nzomo

Project Title: Multilingual Information Access: Practices & Perceptions of bi/multilingual academic users

Principal Investigator: Dr. Isola Ajiferuke

Letter of Information

1. **Invitation to Participate**

   You are being invited to participate in a study exploring the use of Multilingual Information Access (MLIA) tools in online searching by Bi/multilingual academic users. The findings of this study could contribute towards informing system designers in developing Multilingual Information Retrieval (MLIR) technologies. The study will also provide an opportunity to evaluate the effectiveness of already existing MLIR technologies. Additionally, the study could also provide valuable information to LIS (Library and Information Science) professionals on how to design services-e.g. information literacy classes for this specific user- group- i.e. bi/multilingual academic users. We are asking you to take part in this study because we think you might be interested in this topic.

2. **Purpose of the Letter**

   The purpose of this letter is to provide you with information required for you to make an informed decision regarding participation in this research.

3. **Purpose of this Study**

   The purpose of this study is to gain insight into the information searching behavior of bi/multilinguals. Specifically, it explores linguistic determinants in online information searching with an aim to: provide empirical evidence to support recommendations for the effective *user-centered* design of Multilingual Information Retrieval (MLIR) systems; provide a *user-centered* evaluation of existing Multilingual Information Access (MLIA) tools, and offer the basis of a framework for Library & Information Science (LIS) professionals in teaching information literacy and library skills for bi/multilingual academic users.

4. **Inclusion Criteria**

   To participate in this study you need to be over 16 years of age, be a non-native English speaker OR a bilingual/ multilingual speaker of at least one other language in addition to English.

5. **Exclusion Criteria**

   Individuals who are monolingual are not eligible to participate in this study.

6. **Study Procedures**

   If you agree to participate, you will be asked to complete a web survey. The web survey takes about 10-15 minutes to complete and is to be completed anonymously at your convenience.

7. **Possible Risks and Harms**

   There are no known or anticipated risks or discomforts associated with participating in this study.

8. **Possible Benefits**

   You may not directly benefit from participating in this study but information gathered may provide benefits to society as a whole. The possible benefits to society may be that the study could potentially highlight practical application domains where Multilingual Information Retrieval (MLIR) technologies can be employed, thus helping motivate the need for further developments in MLIR while also providing an opportunity to evaluate the effectiveness of already existing technologies. For example, in keeping with the current emphasis on user-centered design, the proposed study would contribute towards informing system designers on how to cater to users with diverse linguistic backgrounds and language proficiencies. Web designers for multinational companies and diplomatic missions could also garner valuable information to help them in their localization and Internationalization efforts. Another practical implication of the study points towards adapting a user-centered model for providing services for this user group e.g. models or curricula for teaching information literacy and library skills to bi/multilinguals or Limited English Proficient (LEP) users.

9. **Compensation**

   You will not be compensated for completing the web survey. However, if you choose to also participate in the follow up experiment or Focus Group Discussions, you will receive a $20 gift card.

10. **Voluntary Participation**

Participation in this study is voluntary. You may refuse to participate, refuse to answer any questions or withdraw from the study at any time with no effect on your future academic status.

11. Confidentiality

All data collected will remain confidential and accessible only to the investigators of this study. No self-identifying data is required from you and your responses will be treated with the strictest confidence.

12. Contacts for Further Information

If you require any further information regarding this research project or your participation in the study you may contact the Principle Investigator, Dr. Isola Ajiferuke, by phone at xxxxxxxxxx or by e-mail at xxxxxxxxxx or you may contact the student researcher Peggy Nzomo by phone at xxxxxxx.

If you have any questions about your rights as a research participant or the conduct of this study, you may contact The Office of Research Ethics (519) 661-3036, email: ethics@uwo.ca.

13. Publication

The results of the study will be published, disseminated and/ or used in a PhD dissertation, in scholarly journals, conference proceedings and on the study website. If you would like to receive a copy of any potential study results, please contact Peggy Nzomo by e-mail at xxxxxx or by phone at xxxxxxxxx

14. Consent

Completion of the survey is indication of your consent to participate.

This letter is yours to keep for future reference.

Web Survey

Note: Your voluntary completion of this questionnaire signifies consent to

participate in this study.

□ Graduate   □Undergraduate

Major or Department: _____

Gender: □ Male   □Female

Age: □ 18-25   □26-35   □ 36-45   □Over 45

Native Language: _____

Other languages used (Please indicate level of fluency for each one- Advanced,

intermediate or Beginner):

_____

_____

_____

Are you now or have you within the last two years enrolled in ESL (English as a Second

Language) classes?

□ No   □Yes

Is English your current primary language of Instruction?

□ No   □Yes

If so, for how long has this been the case?

□ Less than 1year   □1-2 years   □ 3-4 years

□5-10 years   □Over 10 years

Do you ever use any languages other than English for searching the internet

and/or electronic databases?

□ No   □Yes (Please Specify) _____

1. What search engines do you use to get information from the internet? (Check all that apply)

   □Google   □Yahoo   □MSN (Bing) □Other (Please specify) _____

2. a)How often do you use the internet?

   □Daily   □2-3 times a week   □4-5 times a week

   □Once a week   □ Less than once a week

3. For what purpose do you use the internet? (check all that apply)

   □E-mail   □Shopping

   □Social Networking (Facebook, Twitter etc.)

   □For research

   □To keep up with current news

   □Other. (Please specify) _____

4. a. What language do you use while searching for information on the internet?(check all that apply).

   □English   □Native language   □Other (Please specify) _____

   b. How would you rate your level of English language proficiency?

   □Very good   □Good   □Average   □Poor   □Very Poor

5. If you get your results in English, do you try to find a translation for the webpage?

   □Yes   □Sometimes   □No

6. If so, which of the following do you *most often* use for translation? (check all that apply)

□ Google Translate □ MSN/Bing Translator □ Yahoo Babel Fish

□ Translation services (e.g. Systran, SDL) □Translation forums (e.g.

howtosayin.com; help.berberber.com) □Other- (Please specify)_____

7. a) Do you use your library's electronic databases? (e.g. Academic Search

   Complete, WorldCat, JSTOR, ERIC, EBSCOHOST, PROQUEST). Please give

   an example of one you most frequently use.

   _____

   b) For how long have you been using electronic databases?

   □Less than 1year □1- 3years □3-6 years □Over 6 years

8. Where did you find out about the library databases you use? Check all that apply.

   □Class instructor/professor □Librarian □Classmates

   □Other (please specify) _____

9. In what language do you formulate your search terms (keywords)?

   □ English □Native language □ Other. Please specify_____

   If not English, do you translate them from another language into English?

   □Yes □Sometimes □No

10. Are you *usually* satisfied with the results you get from your search?

    □Yes □Somewhat satisfied □No

11. In what language do you most often get your results?

    □English □Native language □Both □Other. Please specify____ _____

If you get your results in English do you usually get it translated into another

language?

    □Yes □Sometimes □No

12. Which of the following do you use to get translations for your results?

    □ Translation service in the database □Google , Yahoo or MSN/Bing

     □Friends/Family   □Other (please specify) _____

13. In the process of searching for information (both on the internet and on electronic

    databases) do you need linguistic help in any of the following areas when dealing

    with a foreign language? Please check all that apply.

    □In thinking up search terms

    □In writing the correct spelling

    □In finding **more effective** terms

    □In interpreting the search results (e.g. understanding the information about the retrieved

    titles)

    □In understanding the relevance of each document (e.g. by means of a summary

    or abstract)

    □To fully translate the full text of the relevant documents after the search session

    □ None

    □Other, please specify _____

14. Which of the following language tools do you use while searching for information

    online?(on the internet or on electronic databases)

    □Translation services   □Limit results by language   □ Non-English Search

    engines □ Other (please specify) _____

15. Which of the following services do you think would be most helpful to you in

    searching for information from your library databases? (Please check all that

    apply).

□Computer/internet access   □More library instruction

□Online Tutorials   □Library guides in multiple languages

□ Chat Reference   □Translation services

□ Multilingual options for searching the Library catalog and electronic databases

□Other (please specify)_____

Important Note:

If you would like to participate in a follow up focus group discussion that could

contribute towards formulating recommendations for the design of more effective

and user friendly Multilingual Information Retrieval Systems and recommendations

for designing library services at your institution, please indicate below:

⬜**I would like to participate in a focus group discussion.**

Click here to contact researcher.

If you are a native speaker of Chinese, French and Spanish, and would like to

participate in a follow up experiment to the study, please indicate below.

⬜**I would like to participate in the experiment.**

Click here to contact researcher.

Both the experiment and the Focus Group Discussions will be recorded. For

participating either in the experiment or FGD, you will be given a $20 gift card as

compensation for your time. The experiment will involve searching for information

on the internet and on electronic databases. Expect to spend 20-30-minutes on the

experiment and then respond to a short questionnaire about the search. The Focus

Group discussions will take about 45-60 minutes.

Thank you for your participation.

Appendix B

Experiment Instruments

Project Title: Multilingual Information Access: Practices & Perceptions of
        Bi/multilingual academic users.

Principal Investigator: Dr. Isola Ajiferuke

Letter of Information

1. **Invitation to Participate**

   You are being invited to participate in a study exploring the use of Multilingual Information Access (MLIA) tools in online searching by Bi/multilingual academic users. The findings of this study could contribute towards informing system designers in developing Multilingual Information Retrieval (MLIR) technologies. The study will also provide an opportunity to evaluate the effectiveness of already existing MLIR technologies. Additionally, the study could also provide valuable information to LIS (Library and Information Science) professionals on how to design services-e.g. information literacy classes for this specific user- group- i.e. bi/multilingual academic users. We are asking you to take part in this study because we think you might be interested in this topic.

2. **Purpose of the Letter**

   The purpose of this letter is to provide you with information required for you to make an informed decision regarding participation in this research.

3. **Purpose of this Study**

   The purpose of this study is to gain insight into the information searching behavior of bi/multilinguals. Specifically, it explores linguistic determinants in online information searching with an aim to: provide empirical evidence to support recommendations for the effective *user-centered* design of Multilingual Information Retrieval (MLIR) systems; provide a *user-centered* evaluation of existing Multilingual Information Access (MLIA) tools, and offer the basis of a framework for Library & Information Science (LIS) professionals in teaching information literacy and library skills for bi/multilingual academic users.

4. **Inclusion Criteria**

To participate in this study you need to be over 16 years of age, and a bilingual speaker of *at least one* of the following languages in addition to English: Chinese, French, Spanish, German or Korean.

5. **Exclusion Criteria**

   Individuals who are monolingual and/ or do not speak Chinese, French, Spanish, German or Korean are not eligible to participate in this study.

6. **Study Procedures**

   If you agree to participate, you will be asked to perform an experiment. The experiment will involve searching for information on the internet and on electronic databases and your search will be recorded by screen capture software. It is anticipated that the experiment will take 20-30 minutes and then you will be asked to respond to a short questionnaire about the search which will take an additional 5 minutes. The experiment will be conducted at a computer lab in the Faculty of information & Media Studies in the North Campus Building. There will be a total of 8 participants in the computer lab per session.

7. **Possible Risks and Harms**

   There are no known or anticipated risks or discomforts associated with participating in this study.

8. **Possible Benefits**

   The possible benefits to participants may be that they would learn how to effectively search for information online in more than one language; at the least, they will be introduced to Multilingual Information Access (MLIA) tools that could potentially aid them in searching for information in any language they may not be fully proficient in but may need to use.

   The possible benefits to society may be that the study could potentially highlight practical application domains where Multilingual Information Retrieval (MLIR) technologies can be employed, thus helping motivate the need for further developments in MLIR while also providing an opportunity to evaluate the effectiveness of already existing technologies. For example, in keeping with the current emphasis on user-centered design, the proposed study would contribute towards informing system designers on how to cater to users with diverse linguistic backgrounds and language proficiencies. Web designers for multinational companies and diplomatic missions could also garner valuable information to help them in their localization and internationalization efforts.

Another practical implication of the study points towards adapting a user-centered model for providing services for this user group e.g. models or curricula for teaching information literacy and library skills to bi/multilinguals or Limited English Proficient (LEP) users.

9. Compensation

You will be given a $20 gift card as compensation for your participation in the Experiment.

10. Voluntary Participation

Participation in this study is voluntary. You may refuse to participate, refuse to answer any questions or withdraw from the study at any time with no effect on your future academic status.

11. Confidentiality

All data collected will remain confidential and accessible only to the investigators of this study. No self-identifying data is required from you and your responses will be treated with the strictest confidence.

12. Contacts for Further Information

If you require any further information regarding this research project or your participation in the study you may contact the Principle Investigator, Dr. Isola Ajiferuke, by phone at xxxxxxx or by e-mail at xxxxxxx or you may contact the student researcher: Peggy Nzomo by email at xxxxxxxxx or by phone at xxxxxx.

If you have any questions about your rights as a research participant or the conduct of this study, you may contact The Office of Research Ethics (519) 661-3036, email: ethics@uwo.ca.

13. Publication

The results of the study will be disseminated and/ or used in a PhD dissertation, in scholarly journals and conference proceedings. If you would like to receive a copy of any potential study results, please contact xxxxxxx by e-mail at xxxxxx or by phone at xxxxxxxx.

14. Consent

Written consent: See attached form.

This letter is yours to keep for future reference.

Consent Form

Project Title: Multilingual Information Access: Practices & perceptions of bi/multilingual academic users.

Study Investigator's Name: Dr. Isola Ajiferuke

I have read the Letter of Information, have had the nature of the study explained to me and I agree to participate. All questions have been answered to my satisfaction.

☐   I give permission for this session to be recorded.

☐   I do NOT give permission for this session to be recorded.

☐   (Please note: You may not participate in the Experiment if you do not wish to have the search recorded using screen capture software)

Participant's Name (please print):_____

Participant's Signature: _____

Date: _____

Person Obtaining Informed Consent (please print): _____

Signature:_____

Date: _____

Experiment Search Tasks

Topic 1. Shopping- Electronics; System: Google

Tasks 1A: Shopping: Smart Phone

You are looking for information to help you purchase a Smartphone. You are interested in finding reviews of different smart phones and also in finding a reliable dealer. The smart phone should have basic features such as GPS navigation and a good camera.

Task 2A: Shopping: Laptop

As in Task 1A, participants searched for information to help them arrive at a decision in choosing a laptop and where to buy it. **The instructions for this task were given in the respective languages used in the experiment- i.e. Chinese, French, German, Korean and Spanish.**

Topic 2: Environmental studies; System: WorldCat

Tasks 1B: Global warming

You are taking an introductory course in Environmental Studies. For your final paper, you have been asked to choose a topic that is of interest to you. You have chosen to write a paper on Global Warming and are looking for information in different formats- i.e. books, websites and articles so as to find information that covers both the current aspects of the topic as well as general introductory, but scholarly information about the topic. You decide to start your search in WorldCat as it will give you information on where to borrow the books that you need, or how to access articles that may not be readily available on the Internet.

Task 2B: Wetlands

Instructions for this task were similar to task A, **and were given in their native language or the respective languages that were used in the experiment i.e. Chinese, French, German, Korean or Spanish.**

You are taking an introductory course in Environmental Studies. For your final paper, you have been asked to choose a topic that is of interest to you. You have chosen to write a paper on Wetlands and are looking for information in different formats- i.e. books, websites and articles so as to find information that covers both the current aspects of the topic as well as general introductory, but scholarly information about the topic. You decide to start your search in WorldCat as it will give you information on where to borrow the books that you need, or how to access articles that may not be readily available on the Internet.

Translations for Tasks 1B and 2B

<u>**Chinese:**</u>

1b. Laptop Task

你正在查找购买新笔记本电脑所需的资料。你希望找到各类笔记本电脑的评价报告，以及可靠的销售代理或商店。你决定从Google入手寻找相关信息。

2b. Wetlands Task:
你正在上"环境研究学"基础课。为完成这门课的期末作业，你需要选择一个自己感兴趣的题目。你最终决定撰写一篇关于湿地的论文。现在，你正从不同渠道（如书籍、网站和期刊文章）中寻找所需资料。除与湿地有关的最新研究成果外，你还需要入门型学术材料。

你决定从WorldCat入手寻找相关信息，从而找到需从图书馆借阅的书籍，以及其它不能从网上免费下载的学术期刊文章。

<u>**French**</u>

1b. Laptop Task

 Vous cherchez des renseignements afin d'acheter un nouvel ordinateur portable. Vous

désirez trouver des évaluations de différents modèles ainsi qu'un marchand ou un

magasin fiable où vous pourriez l'acheter. Vous décidez de commencer par une recherche

dans Google.

2b. Wetlands Task

Vous suivez un cours d'introduction aux études environnementales. Pour votre dernier

travail, vous devez choisir un sujet qui vous intéresse. Vous avez choisi de rédiger votre

travail sur les zones humides et vous êtes à la recherche de renseignements, dans

différents formats (par exemple des livres, des sites web et des articles), sur les aspects

actuels de la question ainsi qu'une introduction générale. Vous décidez de commencer

votre recherche dans WorldCat, car vous y trouverez de l'information sur les endroits où

vous pourrez emprunter les livres que vous voulez et accéder aux articles qui ne sont pas facilement disponibles sur internet.

German

1b. Laptop Task:

Sie suchen Informationen, die Ihnen beim Kauf eines neuen Laptops helfen. Sie möchten gern Rezensionen zu verschiedenen Laptops lesen sowie einen zuverlässigen Händler oder ein zuverlässiges Geschäft finden, von dem sie einen Laptop kaufen können. Sie entscheiden sich zu einer Google-Suche.

2b Wetlands Task:

Sie belegen einen Einführungskurs in Umweltstudien. Für Ihre Semesterarbeit sollen Sie ein Thema suchen, das sie interessiert. Sie haben sich dazu entschieden, eine Arbeit über Feuchtgebiete zu schreiben und suchen daher Informationen in verschiedenen Formaten wie z.B. Büchern, Webseiten und Artikel, um Informationen zu finden, die sich sowohl mit den gegenwärtigen Themenaspekten als auch mit allgemeinen, einführenden, jedoch akademischen Aspekten befassen. Sie entschließen sich zu einer WorldCat-Suche, da dieser Suchkatalog Ihnen Informationen zur Bücherleihe und zum Auffinden von Artikeln gibt, die Sie benötigen, aber nicht einfach über das Internet zugänglich sind.

1b. Laptop Task

En este escenario estás intentando buscar información que te ayude en el proceso de compra de un nuevo ordenador portátil. Te interesa especialmente encontrar reseñas de diferentes portátiles y también información sobre cuál sería el mejor lugar (tienda, proveedor, etc…) donde comprarlo. Has decidido empezar tu búsqueda en Google.

2b. Wetlands Task

Estás matriculado/a en un curso de iniciación a Estudios Medioambientales. Como parte de tu trabajo final tienes que elegir un tema que te interese y tú has elegido enfocar tu ensayo en el tema de los pantanos. Tienes que buscar información en diferentes formatos (libros, páginas web, artículos, etc…) que trate aspectos generales del tema así como otros que estén más de actualidad, pero quieres que la información sea académica. Decides empezar la búsqueda en WorldCat ya que te proporcionará información sobre dónde puedes pedir en préstamo los libros que necesitas o cómo acceder a artículos que no están fácilmente accesibles en Internet.

Korean

1b. Laptop Task

당신은 새로운 랩탑 구매 도움을 위한 정보를 찾고 있습니다.
당신은 여러 종류의 랩탑의 리뷰를 찾는데 관심이 있으십니다.
그리고 또한 랩탑 구매를 할 수 있는 믿을 수 있는 판매자 또는 가게를 찾는데 관심이 있으십니다.
당신은 구글 검색을 통해 시작하도록 결정합니다.

2b. Wetlands Task

당신은 환경 학습의 입문 코스를 하고 있습니다.

당신의 파이널 페이퍼를 위해서, 당신의 관심 주제를 선정 하도록

요구 되어 왔습니다.

당신은 습지대에 관한 페이퍼를 쓰도록 선택되었고

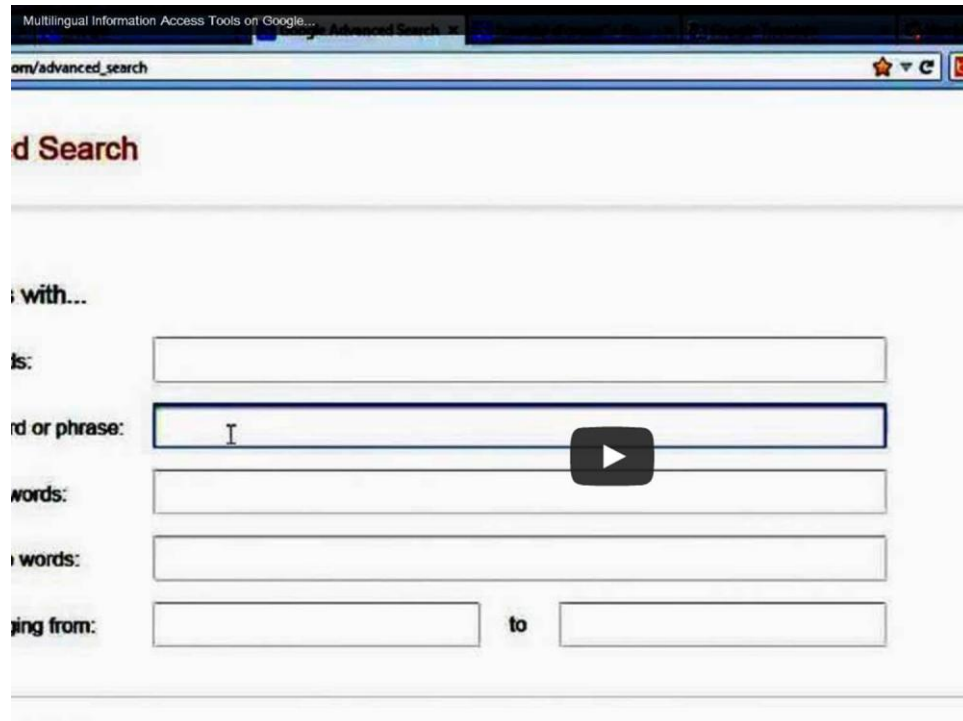일반적인 입문서와 마찬가지로 현재의 관점의 주제를 다룰 수 있는

정보를 찾기 위한 여러 종류의 서적이나 웹사이트를 찾고 있습니다.

그러나 주제에 관한 것은 학문적이어야 합니다.

월드캣을 통한 검색을 통해서 당신이 필요한 서적을 빌릴 수 있는

정보와 인터넷에서 읽을 수 없는 기사에 어떻게 접속 할 수 있는지를

시작하도록 결정합니다. .

Experiment Video Tutorial

Double click on video above or Ctrl+click to follow link below:

Multilingual Information Access (MLIA) tools Tutorial

Instructions for the Experiment

1. The computers to be used in the experiment are already logged on, and will give you access to the internet through Internet Explorer. (If you wish to use a different web browser, please let the researchers know).

2. On your screen you will have three tabs open. Clicking on the first tab will show a video Demo of how to use MLIA tools on the two systems in the experiment- Google and WorldCat. You may click out of the video at any time and also come back to it at any time during the experiment. The second Tab will give you access to Google- where you will perform Tasks 1A and 2A. The third tab will provide access to WorldCat, where you will perform Tasks 1B and 2B.

3. There is no time limit for the experiment, and you may stop the experiment at any time you wish to do so.

4. After you watch the video tutorial and are ready to start the experiment, please let the researcher know so as to start recording your session.

1. Please list your answers (the most relevant or useful website) you found for the respective questions, you may list two, and if no relevant answers were found- leave blank.

A.   Smart Phone_____

On a scale of 1-5, with 1 being not satisfied at all and 5 being extremely satisfied, indicate how satisfied you were with the results you retrieved for this question._____

B.   Laptop _____

_____

On a scale of 1-5, with 1 being not satisfied at all and 5 being extremely satisfied, indicate how satisfied you were with the results you retrieved for this question._____

2. Please list your answers (the most relevant or useful article, book or website) you found for the respective questions. You may list two and if no relevant answers were found- leave blank.

A.   Global Warming_____

_____

On a scale of 1-5, with 1 being not satisfied at all and 5 being extremely satisfied, indicate how satisfied you were with the results you retrieved for this question._____

B.   Wetlands_____

_____

On a scale of 1-5, with 1 being not satisfied at all and 5 being extremely satisfied, indicate how satisfied you were with the results you retrieved for this question._____

Post experiment Questionnaire

1. Prior to this experiment, had you used any of the following MLIA tools while searching for information online? (Check all that apply)

    □Limit by language   □Multilingual interface   □Machine translation

    □Country specific Google or Yahoo search   □Multilingual information retrieval

    □Virtual keyboard/ Non-roman alphabet characters

    □Cross - language search (Typing your query or keywords in one language and retrieving results in a different language).

2. Which of the above mentioned tools are you likely to use again? (Check all that apply)

    □Limit by language   □Multilingual interface   □Cross - language search

    □Country specific Google or Yahoo search   □Multilingual information retrieval

    □Virtual keyboard/ Non-roman alphabet characters □Machine translation

3. If you used MLIA tools, at which stage during the search session do you feel you MOST needed the support of MLIA tools?

    □Choosing the keywords (Query formulation)

    □Assessing the relevance of the results

    □ Reading the information I retrieved

4. On a scale of **1-5** rate the overall usefulness of the MLIA tools you were introduced to, *with 1 being not useful at all and 5 being extremely useful*.

    _____

5. On a scale of **1-5** rate how easy it was to use the MLIA tools you were introduced to, *with 1 being not easy at all and 5 being extremely easy*._____

6. Given a choice between searching with MLIA tools and without MLIA tools, what would be your preference?

□**Without** MLIA tools   □**With** MLIA tools   □No Preference

b) Explain your choice

_____

_____

_____

7. Do you have any other comments you would like us to know about the experiment/ or your experience participating in this study?

_____

_____

_____

Appendix C

Instruments: Focus Group Discussions & Interviews

Project Title: Multilingual Information Access: Practices & Perceptions of
bi/multilingual students

Principal Investigator: Dr. Isola Ajiferuke

Letter of Information

1. **Invitation to Participate**

   You are being invited to participate in a study exploring the use of Multilingual Information Access (MLIA) tools in online searching by Bi/multilingual academic users. The findings of this study could contribute towards informing system designers in developing Multilingual Information Retrieval (MLIR) technologies. The study will also provide an opportunity to evaluate the effectiveness of already existing MLIR technologies. Additionally, the study could also provide valuable information to LIS (Library and Information Science) professionals on how to design services-e.g. information literacy classes for this specific user- group- i.e. bi/multilingual academic users. We are asking you to take part in this study because we think you might be interested in this topic.

2. **Purpose of the Letter**

   The purpose of this letter is to provide you with information required for you to make an informed decision regarding participation in this research.

3. **Purpose of this Study**

   The purpose of this study is to gain insight into the information searching behavior of bi/multilinguals. Specifically, it explores linguistic determinants in online information searching with an aim to: provide empirical evidence to support recommendations for the effective *user-centered* design of Multilingual Information Retrieval (MLIR) systems; provide a *user-centered* evaluation of existing Multilingual Information Access (MLIA) tools, and offer the basis of a framework for Library & Information Science (LIS) professionals in teaching information literacy and library skills for bi/multilingual academic users.

4. **Inclusion Criteria**

   To participate in this study you need to be over 16 years of age, be a non-native English speaker OR a bilingual/ multilingual speaker of at least one other language in addition to English.

5. **Exclusion Criteria**
   Individuals who are monolingual are not eligible to participate in this study.

6. **Study Procedures**
   If you agree to participate, you will be asked to participate in a Focus Group Discussion consisting of 8 students. The purpose of the discussion is to get input from bilingual/ multilingual students on their perspectives about the design of more effective and user friendly Multilingual Information Retrieval Systems. Additionally, the discussions will seek to get the students' perspectives on how library services could be designed in order to better respond to the language related challenges they face while searching for information online. The Focus group discussion will take about 45-60 minutes and will be recorded. The session will take place in one of the class rooms in the Faculty of Information & Media Studies in the North Campus Building.

7. **Possible Risks and Harms**
   There are no known or anticipated risks or discomforts associated with participating in this study.

8. **Possible Benefits**
   You may not directly benefit from participating in the Focus Group Discussions but information gathered may be used to inform system designers in developing Multilingual Information Retrieval (MLIR) systems that are more efficient and user-friendly. Another practical implication of the study points towards adapting a user-centered model for providing services for bi/multilinguals or Limited English Proficient (LEP) users e.g. models or curricula for teaching information literacy and library skills to this group of users.

9. **Compensation**
   You will be given a $20 gift card as compensation for your participation in the Focus Group discussion.

10. **Voluntary Participation**
    Participation in this study is voluntary. You may refuse to participate, refuse to answer any questions or withdraw from the study at any time with no effect on your future academic status.

11. Confidentiality

All data collected will remain confidential and accessible only to the investigators of this study. No self-identifying data is required from you and your responses will be treated with the strictest confidence.

12. Contacts for Further Information

If you require any further information regarding this research project or your participation in the study you may contact the Principle Investigator, Dr. Isola Ajiferuke, by phone at xxxxxx or by e-mail at xxxxxxxx, or you may contact the student researcher: Peggy Nzomo by email at xxxxxxxxxxx.

If you have any questions about your rights as a research participant or the conduct of this study, you may contact The Office of Research Ethics (519) 661-3036, email: ethics@uwo.ca.

13. Publication

The results of the study will be disseminated and/ or used in a PhD dissertation, in scholarly journals and conference proceedings. If you would like to receive a copy of any potential study results, please contact Peggy Nzomo by e-mail at xxxxxxx. or by phone at xxxxxxx.

14. Consent

Written consent: See attached form.

This letter is yours to keep for future reference.

Consent Form

Project Title: Multilingual Information Access: Practices & Perceptions of
bi/multilingual academic users.

Study Investigator's Name: Dr. Isola Ajiferuke

I have read the Letter of Information, have had the nature of the study explained to me
and I agree to participate. All questions have been answered to my satisfaction.

☐   I give permission for this session to be recorded.

☐   I do NOT give permission for this session to be recorded.

             (Please note: You may not participate in the Focus Group Discussions if

             you do not wish to have the session recorded.)

Participant's Name (please print):   _____

Participant's Signature:_____

Date: _____

Person Obtaining Informed Consent (please print)_____

Signature:_____

Date: _____

Project Title: Multilingual Information Access: Practices & Perceptions of
bi/multilingual academic users.

Principal Investigator: Dr. Isola Ajiferuke

Letter of Information

1. **Invitation to Participate**
   You are being invited to participate in a study exploring the use of Multilingual
   Information Access (MLIA) tools in online searching by Bi/multilingual
   academic users. The findings of this study could contribute towards informing
   system designers in developing Multilingual Information Retrieval (MLIR)
   technologies. The study will also provide an opportunity to evaluate the
   effectiveness of already existing MLIR technologies. Additionally, the study
   could also provide valuable information to LIS (Library and Information Science)
   professionals on how to design services-e.g. information literacy classes for this
   specific user- group- i.e. bi/multilingual academic users. We are asking you to
   take part in this study because we think you might be interested in this topic.

2. **Purpose of the Letter**
   The purpose of this letter is to provide you with information required for you to
   make an informed decision regarding participation in this research.

3. **Purpose of this Study**
   The purpose of this study is to gain insight into the information searching
   behavior of bi/multilinguals. Specifically, it explores linguistic determinants in
   online information searching with an aim to: provide empirical evidence to
   support recommendations for the effective *user-centered* design of Multilingual
   Information Retrieval (MLIR) systems; provide a *user-centered* evaluation of
   existing Multilingual Information Access (MLIA) tools, and offer the basis of a
   framework for Library & Information Science (LIS) professionals in teaching
   information literacy and library skills for bi/multilingual academic users.

4. **Inclusion Criteria**
   To participate in this study you need to be a librarian at Western University or its
   affiliated institutions and be involved either now or in the past in teaching
   information literacy classes.

5. **Exclusion Criteria**
Librarians who are not or have never been involved in teaching information literacy classes at an academic institution are not eligible to participate in the Focus Group discussions.

6. **Study Procedures**
If you agree to participate, you will be asked to participate in a Focus Group Discussion consisting of 8 librarians. The Focus Group Discussions are intended to get input from the librarians on what their experience is in serving or designing services for bilingual or multilingual academic library users. In particular, the researcher is interested in their perspectives on how to build more effective and user friendly Multilingual Information Retrieval Systems and also on how library services could be designed in order to better respond to the language related challenges these students face while searching for information online. The Focus group discussion will take about 45-60 minutes and will be recorded. The session will take place in one of the classrooms in Weldon library.

7. **Possible Risks and Harms**
There are no known or anticipated risks or discomforts associated with participating in this study.

8. **Possible Benefits**
You may not directly benefit from participating in the Focus Group Discussions but information gathered may be used to inform system designers in developing Multilingual Information Retrieval (MLIR) systems that are more efficient and user-friendly. The discussions could also generate useful ideas on how to design services e.g. information literacy classes for this specific user-group (bi/multilinguals or Limited English Proficient (LEP) users.

9. **Compensation**
You will be given a $20 gift card as compensation for your participation in the Focus Group discussion.

10. **Voluntary Participation**
Participation in this study is voluntary. You may refuse to participate, refuse to answer any questions or withdraw from the study at any time with no effect on your employment.

11. Confidentiality

All data collected will remain confidential and accessible only to the investigators of this study. No self-identifying data is required from you and your responses will be treated with the strictest confidence.

12. Contacts for Further Information

If you require any further information regarding this research project or your participation in the study you may contact the Principle Investigator, Dr. Isola Ajiferuke, by phone at xxxxxxx or by e-mail at xxxxxxx or you may contact the student researcher: Peggy Nzomo at xxxxxxxxxxxxx.

If you have any questions about your rights as a research participant or the conduct of this study, you may contact The Office of Research Ethics (519) 661-3036, email: ethics@uwo.ca.

13. Publication

The results of the study will be disseminated and/ or used in a PhD dissertation, in scholarly journals and conference proceedings. If you would like to receive a copy of any potential study results, please contact Peggy Nzomo by e-mail at xxxxxxxx or by phone at xxxxxxxxx.

14. Consent

Written consent: See attached form.

This letter is yours to keep for future reference.

Consent Form

Project Title: Multilingual Information Access: Practices & Perceptions of
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Study Investigator's Name: Dr. Isola Ajiferuke

I have read the Letter of Information, have had the nature of the study explained to me and I agree to participate. All questions have been answered to my satisfaction.

☐   I give permission for this session to be recorded.

☐   I do NOT give permission for this session to be recorded.

         (Please note: You may not participate in the Focus Group Discussions if

         you do not wish to have the session recorded.)

Participant's Name (please print) _____

Participant's Signature: _____

Date: _____

Person Obtaining Informed Consent (please print):_____

Signature:_____

Date:_____

FOCUS GROUP DISCUSSIONS

To be filled out by FGD Participants

□ Graduate   □Undergraduate

Major or Department: _____

Gender: □ Male   □Female

Age: □ 18-25   □26-35   □ 36-45   □Over 45

Years of experience using the Internet_____

Years of experience using electronic databases_____

LIBRARIAN INTERVIEWS

To be filled out by Interviewees

Institution_____

Position/Title_____

How long have you worked as a librarian?_____

At this institution_____

What is your highest level of Education_____

Duties_____
_____

Years of experience using electronic databases_____

Which Databases do you most often use. (Give one or more examples)

_____

Do your duties include providing Information Literacy / bibliographic instruction

classes?

□ No

□ Yes; and if so, how often do you provide these classes in a given semester?

_____

FOCUS GROUP DISCUSSION GUIDE

1. What was your level of familiarity with Multilingual Information Access (MLIA) tools before participating in this study and in your opinion- do you think these tools are necessary while searching for information online? Why or Why not

2. How would you describe your emotions while searching for information online, especially when you have had to do it in a language in which you are not very proficient ?

3. What is your opinion of the MLIA tools offered in any of the MLIR systems you have used before?   Mention system/or electronic database and discuss:
     a) Aspects you liked
    b) Aspects you did not like
    c) How do you think they could be improved or what additions would you recommend?

4. What kind of language related difficulties/ or frustrations do you often face while searching for information online?

5. What role do you think the library could play in addressing these challenges and any other challenges you have while searching for information online?

6. In your time so far at Western or any other higher education institution you have attended, have you ever attended an Information literacy class/ and or a library tour and do you think these classes / tours are necessary?

7. What kinds of topics were addressed in these classes?

8. What kind of topics would you like to see covered?

INTERVIEW GUIDE- Librarians

Discussion Questions

1. What are some examples of topics you cover in your InfoLit classes?

2. As far as you can recall have any of these classes addressed language related issues in online information searching?

3. Have you received any feedback from the students after you give these classes and if so, can you mention some of the feedback you have received?

4. a. What in your opinion are the major challenges you face in providing online information services for your students? Are any of these language related?
   b.. What language related challenges (if any) do you think students face while searching for information online?

5. What are some ways you think these problems should be addressed?

Appendix D

Ethics Approvals

Western Research

Use of Human Participants - Initial Ethics Approval Notice

Principal Investigator: Dr. Isola Ajiferuke
File Number: 104336
Review Level: Delegated
Protocol Title: The use of MLIA (Multilingual Information Access) tools by bilingual and polyglot academic users: An exploratory study
Department & Institution: Information and Media Studies, Western University
Sponsor:
Ethics Approval Date: September 30, 2013 **Expiry Date:** May 31, 2014

Documents Reviewed & Approved & Documents Received for Information:

Document Name	Comments	Version Date
Western University Protocol		2013/09/06
Instruments	Experiment Description	2013/09/14
Instruments	Web Survey Text	2013/09/14
Revised Letter of Information & Consent	Letter of Information- FGD-Students	2013/09/14
Revised Letter of Information & Consent	Letter of Information-Experiment	2013/09/14
Letter of Information	LOI-Web survey	2013/09/23
Letter of Information & Consent	LOI- FGDLibrarians	2013/09/23
Recruitment Items	Recruitment e-mail	2013/09/23
Instruments	Focus Group Guides	2013/09/23

This is to notify you that The University of Western Ontario Research Ethics Board for Non-Medical Research Involving Human Subjects (NMREB) which is organized and operates according to the Tri-Council Policy Statement: Ethical Conduct of Research Involving Humans and the applicable laws and regulations of Ontario has granted approval to the above named research study on the approval date noted above.

This approval shall remain valid until the expiry date noted above assuming timely and acceptable responses to the NMREB's periodic requests for surveillance and monitoring information.

Members of the NMREB who are named as investigators in research studies, or declare a conflict of interest, do not participate in discussions related to, nor vote on, such studies when they are presented to the NMREB.

The Chair of the NMREB is Dr. Riley Hinson. The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000941.

Signature

Ethics Officer to Contact for Further Information

Grace Kelly	Vikki Tran	Erika Basile

This is an official document. Please retain the original in your files.

Fanshawe College Research Ethics Review Board

Protocol Number: 14-03-31-1
Principal Researcher(s): Dr. Isola Ajiferuke
Research Protocol Title: Multilingual Information Access: practices and perceptions of bi/multilingual academic users.
Research Project Start Date: November 1, 2013
Expected date of termination: August 31, 2014
Documents Reviewed: Protocol; Letters of Information; Instruments (web survey, instructions for the experiment, post experiments questionnaire, task 1 & 2, focus group discussion guide-students)

Approval Notification of Proposed Research Involving Staff/Students and/or facilities at Fanshawe College

Based solely on the ethical considerations raised by the research proposed in the application, the Research Ethics Board has completed its Delegated Review of the above Research Proposal and **Approved** the Project on April 29, 2014.

Comments and Conditions:

Please note that the REB requires that you adhere to the protocol reviewed and approved by the REB. The REB must approve any modifications to the protocol before they can be implemented.

Researchers must report to the Fanshawe REB:
a) any changes which increase the risk to the participants;
b) any changes which significantly affect the conduct of the study;
c) all adverse and/or unexpected experiences in the course of carrying out the study;
d) any new information which may adversely affect the safety of the participants or the conduct of the study.

Researchers must submit a Progress Report annually for all ongoing research projects. In addition, researchers must submit a final report at the conclusion of the project.
 ETHICS APPROVAL DOES NOT CONSTITUTE PERMISSION TO CONDUCT THE RESEARCH, AND APPROVAL FOR CONDUCTING THE PROJECT MUST BE OBTAINED FROM THE DEAN OF THE FACULTY IN WHOSE AREA THE RESEARCH WILL TAKE PLACE, OR IN THE CASE OF COLLEGE WIDE SURVEYS THE OFFICE OF INSTITUTIONAL RESEARCH AND PLANNING. Members of the FCREB who are named as investigators in research studies, or declare a conflict of interest, do not participate in discussion related to, nor vote on, such studies when they are presented to the FCREB.

_____   _____April29, 2014
Mr. Otte Rosenkrantz, PhD   Date
Chair, REB
Fanshawe College

Curriculum Vitae

Peggy I. Nzomo

Education
University of Western Ontario, London, ON. www.uwo.ca
PhD- Library & Information Science, ABD, Expected-June 2015.

McGill University, Montreal, QC. www.mcgill.ca
Master of Library and Information Science (MLIS)
Certificate of Proficiency in French

Kent State University, Kent, OH. www.kent.edu
MA- French Translation

University of Nairobi, Nairobi, Kenya. www.uonbi.ac.ke
B.A. - French and Sociology.

Related Work Experience
2010-2014-University of Western Ontario, London, ON www.uwo.ca
Teaching Assistant/ Research Assistant
Duties: Conducting labs for Information Retrieval classes, Grading and evaluating the students' progress; lecturing; doing research.

2004- Case Western Reserve University, Cleveland, OH www.cwru.edu
Director- Language Resource Center (Part Time, Temporary Project)
Duties: Developing courseware/ web resources for students and faculty of the Department of Modern Languages and Literatures; cataloging and classifying audio-visual materials, database development, maintaining the LRC website, serving on the advising committee for a new multimedia center, supervising student assistants at the LRC.

1999- 2001- Kent State University, Kent, OH www.kent.edu
Teaching Assistant- Modern & Classical Languages Studies
Duties: Teaching Elementary level French; planning lessons and setting weekly quizzes; grading and evaluating the students' proficiency and progress; tutoring; doing research.

Languages
English, French, Swahili

Awards/ Grants
Kent State University- Phi Beta Delta Award
Outstanding Academic Achievement- G.P.A.- 4.0

UNDP (United Nations Development Programme) Professional Advancement Grant
McGill University- MLIS- 1992-1994

Western Graduate Research Scholarship
University of Western Ontario- LIS PhD – 2010-2014

Academic & Professional Memberships
Association for Information Science and Technology (ASIS&T)
American Library Association (ALA)
American Translators Association (ATA-Past)
Ohio Regional Law Libraries (ORALL- Past)
Canadian Association for Information Science (CAIS)
Language & Information Technology Research Lab (LIT.RL)- University of Western
Ontario
Phi Sigma Iota- International Foreign Language Honor Society
Phi Beta Delta -International Scholars Society

Publications/ Conference Papers
Nzomo, P., Rubin, V. L., & Ajiferuke, I. (2012) Multi-lingual Information Access Tools:
User Survey, *iConference 2012,* Toronto, ON.

Nzomo, P., Rubin, V. L. & Ajiferuke, I. (2012). International Students' use of
Multilingual Information Access (MLIA) tools. *The 40th Annual Conference of the
Canadian Association for Information Science: Information in a Local and Global
Context (CAIS / ACSI 2012)*, Waterloo, Ontario, May 31 - June 2, 2012.