Language in the information-seeking context

A study of US scholars using non-English sources

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Abstract

Purpose – The purpose of this paper is to specifically investigate information seeking strategies that are used by scholars in the USA conducting research in languages other than English and the types of shifts that scholars make between strategies in planned, disruptive, and problematic situations.

Design/methodology/approach – Interviews and research diaries were employed to gather information from 16 subjects using seven different languages across seven disciplines. Grounded theory and the constant comparative method were used to analyze types of strategies and types of shifts between strategies.

Findings – This study identified four formal system strategies, seven informal resource strategies, four interactive human strategies, and one hybrid strategy. Subjects in the study selected informal resource and interactive human strategies more often as initial strategies while informal resource strategies are used as final strategies. Moreover, the findings presented a variety of shifts between strategies in planned, disruptive, and problematic situations.

Research limitations/implications – Theoretically, this study introduces a new conceptual model – the information triangle – which facilitates the classification of strategies used by scholars throughout an information seeking task as well as the characterization of the shifts between strategies. Practically, this paper discusses implications for system designers, publishers, and support providers to better meet the needs of this specific group. A primary limitation is related to isolating the variables of language, culture, and geography from other possible factors such as domain knowledge, system knowledge, or limitations of the systems being used.

Originality/value – This study fills a gap in current research in relation to how language plays a role in the selection of and shifts between information seeking strategies used by scholars who rely on sources that are not in English.

Keywords Information retrieval, Languages, Strategies, Information seeking, Qualitative user study, Situations

Paper type Research paper

Introduction

How scholars conduct research is a complex topic, and many models have been built to represent, de-construct, and understand their information seeking strategies. But what if the resources they require to accomplish their research are not in English? An Asian historian may rely upon primary sources that exist only in Chinese, Japanese, or Urdu to provide the information they need for their topic. Language scholars studying twelfth century German texts, nineteenth century Afro-Colombian poetry, indigenous Latin American plays, or Holocaust history require rare and specialized documents as sources. When these scholars have their home base in the USA, the needed documents may also be far away and difficult to access.

Some past studies have been conducted on how scholars in the humanities and social sciences conduct research in their fields. As online resources became more prevalent throughout the 1990s, libraries, information scientists, and research

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methodologists took an interest in whether scholars would embrace these new technologies and whether newer search-based methods would gradually replace more traditional methods. Information researchers have studied research strategies used in the context of specific work and search tasks (Bates, 1989; Xie, 2002, 2008) and have delved into shifts in research tactics within a search task (Pharo, 2004; Xie, 2000; Yuan and Belkin, 2010a, b). Others have identified factors used in determining the selection of search tactics at various stages throughout a search task or analyzed the factors that influence information seeking in relation to situations and transitions (Pharo, 2004; Xie and Joo, 2011).

In the area of non-English information seeking, only a few studies, including that of Meho and Tibbo (2003), have looked at scholars whose research requires the use of materials in other languages. However, these language studies did not analyze strategies and shifts, while studies that do focus on strategies and shifts have not taken into account language as a factor or as part of the information seeking context.

Research problem and research questions

The problematic situations encountered by researchers in the USA using languages other than English can be related to the geographical location of the source, the cultural factors involved in gaining access to the source, or the language itself. Nonetheless, existing research on information seeking strategies (ISSs) among users in general or scholars specifically has not explored how language, culture, and geography effect scholars' choices of strategies and the shifts they make from one strategy to another. This study specifically explores the role that language, culture, and geography play in the information seeking behaviors of US scholars who rely on sources that are not in English. The specific research questions are:

RQ1. What information-seeking strategies are used by scholars conducting research in languages other than English? Which strategies are the most frequently applied first, and which strategies are the most frequently applied last?

RQ2. What shifts do these scholars make between strategies in routine, disruptive, and problematic situations?

This study uses a new conceptual framework that facilitates the analysis of the research strategy shifts made by scholars whose sources are most often not in English and may not be readily available in the country where they conduct their research. The sections below present how this study complements existing research, the conceptual model developed for this specific research problem, the data that were gathered, the findings of the research questions, the implications of those findings, the limitations of the study, and paths for future inquiry.

Literature review

For decades – if not centuries – scholars in history, literature, political science, classics, modern languages, and various other disciplines have relied on strategies such as bibliographic tracing, library browsing, personal collections, conference attendance, and human interaction to identify and obtain sources relevant to their topic of research. With the fairly recent advent of online search tools, most non-scholarly information seeking revolves around "Googling it." Younger scholars, such as those at the undergraduate level, may naturally gravitate toward information seeking strategies

that rely on searching unless they are specifically shown how to engage in the more classic techniques such as bibliographic tracing. Younger scholars also lack the personal collections and the human connections that more mature scholars consider key to their research.

It is important to differentiate between three often conflated concepts: information retrieval (IR), information seeking, and information behavior. IR – the narrowest of the three terms – is defined as finding desired information in an information store or database (Chowdhury, 2004; Large *et al.*, 1999; Meadow *et al.*, 1999). IR is studied either from a system perspective or a user perspective and most often focusses on either the formulation of queries used by users when interacting with a search tool or on the algorithms used by the search tool to match documents to the user's query. Information seeking is a broader term and includes how users find, access, obtain, evaluate, or otherwise interact with sources that support their research. Information seeking, described by Inwersen and Jarvelin (2005, p. 259) as "the acquisition of information from knowledge sources, for instance, from colleagues, through (in)formal channels, and from an information system," is the concept used by scholars such as Ellis (1989), Bates (1989), and Kuhlthau (1991) in the development of their conceptual models. Information behavior, discussed primarily by Wilson (1999, 2000), is the broadest of these terms and includes all types of user-information interaction, including information generation, sharing, and management, as well as unintentional interactions with information. This study focusses on information seeking; all of the subjects were actively and intentionally looking for sources to support their various research projects, and their research strategies are not limited to computer-based systems.

The concept of ISSs has been defined and analyzed by numerous prominent scholars and prior studies. While this study specifically focusses on strategies, the concept of tactics, which Bates (1979a, b) defines as moves that advance the search process, must also be recognized. Tactics, seen at the micro-level, are combined with resources to form broader strategies at the macro-level. Most studies of information seeking strategies have built upon Ellis' (1989) model of information seeking characteristics as well as Kuhlthau's (1999) information search process approach. Marchionini (1995) classified ISSs into two major groupings either as analytical strategies, which are more intentional and systematic, or browsing strategies, which are less formalized. This differentiation is further developed by Yuan and Belkin (2010a, p. 1988) who divide the strategies that they observed into "those characterized by the method of searching, and those characterized by the method of scanning, within the specific information behavior of access." This latter study contributes significantly to the information triangle model presented here, especially in its focus on the access stage of the information seeking process.

A multifaceted classification schema for ISSs, which include: first, goal of the interaction (learn, select); second, method of interaction (scan, search); third, mode of retrieval (recognize, specify); and fourth, types of resources interacted with, were discussed and enhanced (Belkin *et al.*, 1993, 1995; Xie, 2008). Despite some common definitions of what a strategy is, there is neither any prevalent model of how to classify or group those strategies nor any recognized or widely adopted list of common ISSs.

Shifts occur between the various strategies within the same information seeking process, herein referred to as a research thread. Xie's (2000) study explored how users shifted either their interactive intentions or their tactics to fulfill their goals/tasks and how they changed their information seeking strategies to achieve their interactive intentions within an information seeking episode.

Related to the concept of shifts is that of the situations in which they occur. The concept of the problematic situation was first explored and presented by Wersig (1979, p. 54) as a situation that "requires more data to solve the situation than are actually available." Xie (2008) has done the most extensive work in this area, enumerating four types of shifts in interactive intentions and the types of situations that cause them: routine situations lead users to planned shifts; disruptive situations guide users to opportunistic shifts; and problematic situations lead to either assisted or alternative shifts. These will be discussed further in the data analysis section.

Context and the factors that contribute to the overall context affect information seeking behavior. Saracevic's (1997) stratified context model includes factors such as user's knowledge, intent, task, and belief, as well as computer and information resources. Of the four levels of context (information environment, information seeking, interaction, and query levels) identified by Cool and Spink (2002), this study will concentrate on the information seeking level, which explains how the context defined by the user's search goals and tasks influences his/her information seeking behavior. Kelly (2006a, b) studied which aspects of context should be taken into consideration when studying online information seeking; however, Kelly's conclusions do not include the language or geographic location of the item as a factor contributing to information seeking context.

Some focussed studies have been conducted on the effect of language on information seeking, but none of these incorporate an analysis of ISSs or shifts. Stapleton (2005) included the factor of language in his structured study of how web sources influence the research and writing of second and foreign language (L2) learners. Meho and Tibbo (2003) revisited Ellis' classic study and narrowed the field to social scientists who conduct research on stateless nations, a field that can require documents from geographically remote locations. They specifically explored the acquisition stage of the information seeking process, observing that scholars may not be able to succeed in accessing the full text of an item identified in the searching stage, and pointing out participants' insistence on the importance of creating and maintaining a close relationship with a broad range of people such as friends, colleagues, scholars working on similar topics, organizations, government officials, and booksellers, with the goal of building collections, accessing materials, and gathering and sharing information. Green (2000) compared the use of "informal techniques" including footnote tracing from current literature, footnote tracing from review articles, following recommendations from colleagues, consulting one's personal collection or bibliographic files, and browsing library collections, as compared to the "systematic use of the formal bibliographic apparatus," (p. 202) including various types of databases and search tools. Green's research is especially useful as a foundation for this study in that she clearly understands and draws attention to some of the special qualities that make humanities (and some social science) research unique, including heavy use of primary sources. Kim (2009) breaks down the strategy of web searching into methods, objects and modes, conceptually similar to Xie's methods, entities, and attributes.

This study fills a significant gap in the literature where the study of ISSs and shifts intersect with the study of the influence of language in information seeking. Similar studies are virtually non-existent. The hope is that this study will initiate a trend in information studies that takes language into account as a factor in analyzing how scholars identify and acquire information sources for their research.

Conceptual model

This study makes use of a new conceptual model – the information triangle – developed as a result of the authors' research, which facilitates the classification of strategies used by scholars throughout a specific information seeking task as well as the characterization of the shifts between strategies (see Figure 1). While the three classifications that make up the sides of the information triangle correspond to some theories in the previous literature, they are derived primarily inductively and directly from the subjects in the study as well as the authors' previous and subsequent studies.

The three categories that make up the information triangle are "formal system strategies," "informal resource strategies," and "interactive human strategies." This three-sided model most closely fits Inwersen and Jarvelin (2005, p. 259) description of information seeking as "the acquisition of information from knowledge sources, for instance, from colleagues, through (in)formal channels, and from an information system." Each of the three categories is described and explained below.

Formal system strategies are those related to the "formal bibliographic apparatus" (Green, 2000, p. 202) in which IR search tactics are used in conjunction with sources such as periodical databases, OPACs, electronically indexed and searchable finding aids, digital libraries and repositories, and web-based resources. There are three characteristics that determine their classification as formal systems strategies: search-based; computer systems-based; and having an interactive interface.

Numerous scholars have gone to some length to differentiate between formal and informal strategies. Most differentiate formal strategies as search-based and informal strategies as browse-based (Ruthven *et al.*, 2008). Another common distinction is that formal strategies involve computer-based systems while informal/manual strategies do not (Wilson, 2000). It is overly simplistic, however, to say that all computer-based systems are uniquely search-based, since many system designers have seen the value of browsing techniques and have sought to incorporate browsing capabilities into their computer-based systems (Chang and Rice, 1993).

Xie (2008, p. viii) explains in more depth the components that make up an IR system, one of which is an "interface for user input and system output" that supports the presence of an interactive interface. Thus, the level and type of interaction help define formal systems strategies as compared to the other two categories.

Informal resource strategies include those that are traditionally considered in relationship to print sources, including: browsing; citation tracing; and using indexes, bibliographies, and static finding aids. Using informal resource strategies, scholars work directly with resources or their surrogates without the intermediary of an interactive IR

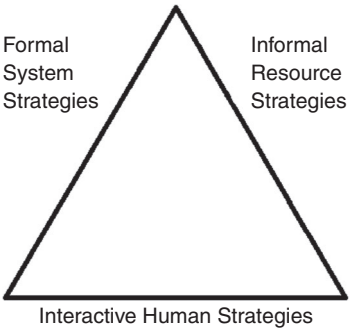

Figure 1.
The information triangle

system or interface. Strategies such as browsing websites or bibliographies are considered informal even if they are performed online using a computer because the user does not formulate and present a query to a system which then returns a response.

Chang and Rice (1993, p. 235) differentiate browsing from formal searching: "Browsing has been loosely described as a kind of searching in which the initial search criteria or goals are only partly defined or known in advance." They discuss three different types of browsing: search browsing, general purpose (semidirected), and serendipity browsing. They further explain: "Browsing has been proposed as an alternative approach to IR that does not use Boolean operators or require specific search queries." Browsing is often used when the user "is unable to specify initial search requirements or is unfamiliar with the terminology of a domain of interest, or when he or she wishes to discover the general information content of the database" (Chang and Rice, 1993, p. 238).

The term "informal" is used not only by Inwerson and Jarvelin but also by Green (2000) in her discussion of "informal techniques." Bates (1989), Wilson (2000), and Xie (2008) all refer to "manual" strategies, sources, or techniques, which are generally synonymous with our informal resource strategies.

Interactive human strategies include those that rely on consulting with humans as either an intermediary or a direct resource, including archivists and librarians, colleagues, and other knowledgeable humans, whether directly or through electronic means. Attending conferences and interacting with other participants and obtaining sources from other humans are also interactive human strategies. While previous literature often differentiates search-based from browsing-based strategies, and a few prior models mention human sources in passing, few have classified information seeking from human sources as strategies. One notable exception is the study by Cool and Belkin (2002) that suggests a distinction between information behaviors and communication behaviors, which they define as "behaviors that an individual or group engage in whose primary goals are communicative interaction with another person or persons" (p. 9).

One differentiating factor between interactive human strategies and either formal systems or informal resource strategies is the difference in the level of interactivity. In formal strategies, the interaction is predictable – beginning with a query from the user and a response from the system; iterative interactions with formal systems generally require re-initiation by the user. With informal resource strategies, the user is a consumer of the resources, and the interaction is generally one-sided with the user pursuing the strategy with no real participation from the resource being accessed. The resources – be it the library shelves being browsed, the citations being consulted, etc. – do not initiate interaction nor do they respond to queries.

In human interactions, there is no predictability similar to that of a formal system; a query to a human intermediary may result in subsequent questions to assist the user in formulating their needs or suggestions of alternate strategies rather than simply and directly providing a listing of relevant sources. If the human intermediary does not understand what the user wants, he/she will often pursue an exchange of question and answers until some satisfactory result is achieved. Interactive human strategies are also the only category where the intermediary – rather than the researcher – may initiate the information seeking process or may provide added information at a later time without further prompting from the user. Human intermediaries also differ from systems (at least at the present time), in that they can often understand the concepts and ideas that the researcher is looking for even in the absence of the correct keywords and search terms.

Some earlier definitions of information seeking strategies have included multiple facets. Belkin *et al.* (1993) include four facets: mode; method; goal; and resource. In their discussion of the classification of information seeking interactions, Cool and Belkin (2002) developed a five-faceted system that considers communication behaviors, information behaviors, objects interacted with, common dimensions of interaction, and interaction criteria. Our definition of information seeking strategies includes multiple dimensions, similar to the aforementioned facets, and is based largely on Xie's (2000) model that classifies information search strategies by the two dimensions of methods and entities. The entities (resources) include information, information objects, and humans (Yuan and Belkin, 2010b). The methods correspond to the tactics used by searchers in the research process, similar to those enumerated by Xie (2008): scan; specify; manipulate; consult; select; survey; track; trial-and-error; compare; extract; and acquire.

Since this study seeks to explore the strategy shifts make by scholars when they encounter problematic situations caused by language, the concept of shifts must be explained. Kuhlthau's (1991) information seeking process model identified six stages in task performance which are associated with the physical actions taken. Vakkari (2001) and colleagues (Vakkari *et al.*, 2003) further enhanced Kuhlthau's six stages into three stages: pre-focus; formulation; and post-focus, finding that users changed their search tactics at different stages.

Xie (2008) classifies four types of shifts in retrieval tactics: changes in methods; entities; attributes; and method-entity. That is, when a user encounters a problematic situation that leads to a shift in strategy, they may accomplish it by changing either the method, the entity (source), the attribute, or both method and entity. Our model analyzes shifts in methods and entities rather than attributes since it is the methods and entities that characterize shifts between strategies at the macro-level. Shifts in both method and entity generally cause a shift that moves from one side of the information triangle to another.

Methodology

This study was conducted using 16 human subjects, all of whom are college or university instructors with advanced degrees actively pursuing research on a topic in their field.

Each subject was asked to participate in three activities: first, a pre-interview about their usual ISSs and their demographic data; second, use of a diary to record their research activities during the period of the study; and third, a post-interview where they were asked questions about the research conducted during the research period.

Sampling

Purposive sampling, defined as the selection of a sample on the basis of its contribution of information rich cases for in-depth study (Patton, 2002) was used for this study as well as some snowball sampling. Subjects were selected based on their ability to provide in-depth insight into scholarly information seeking strategies when using non-English sources. To clarify, it is not the language of the researcher but rather the language of the research itself and the sources that is of interest in this study. Since our subject group is based in the USA, and since sources most relevant to research on topics related to Russia, Japan, or Colombia are generally in Russian, Japanese, and Spanish and located in Russia, Japan, and Colombia, identification of, access to, and acquisition of these sources can quickly become problematic. In our study, scholars

using Spanish or German described the same barriers encountered in their research whether their native language was Spanish, German, or English. The qualifications to participate in the study were fairly significant and include:

- Competence in a language other than English and the ability to use that language for research purposes. The native language of the subjects is not considered as a qualifying factor for participation.
- Status as a scholar – faculty member at a college or university.
- Active pursuit of research using non-English resources during the study period.
- Located in the Midwest to allow for in person interviews.

The goal was to identify scholars using a variety of languages in a variety of disciplines. The distribution of the disciplines of the 16 subjects is: seven modern languages; three history; two political science; one classics; one economics; one information studies; and one neuroscience. The distribution of the languages is: six Spanish; three German; two Russian; two Japanese; one Chinese; one Italian; and one Urdu. The detailed characteristics of each subject are shown in Table I.

Sub	Discipline	Research language	Native language	Gender	Research topic
S1	Modern languages	Spanish	English	F	Indigenous central American plays and topics regarding reconciliation
S2	Modern languages	German	English	M	German topics related to the Holocaust and politics and economics
S3	Classics	Italian	English	F	Roman brick stamps
S4	Neuroscience	Spanish	English	F	The indigenous Mbya Guarani people of Argentina
S5	Modern languages	Spanish	Chinese	F	Intercultural themes, especially Chinese and Spanish-speaking world
S6	Information studies	Russian	Russian	F	Libraries and national identities
S7	Political science	Japanese	English	M	How groups and individuals mobilize law to achieve political goals in Japan
S8	History	Urdu	Urdu	F	Religious identity of Indian Muslim families in the states of Uttar Pradesh
S9	Modern languages	Spanish	English	F	Translation as a method for teaching Spanish
S10	Modern languages	Spanish	Spanish	F	Nineteenth century political discourse in Colombia and Mexico
S11	Modern languages	German	German	M	Middle high German (twelfth and thirteenth century)
S12	Political science	German	English	M	German political parties, including extreme left, right, and green
S13	Economics	Russian	Russian	M	Topics in the archives of General Dmitri Volkogonov and other topics related to the former Soviet Union
S14	History	Japanese	English	M	Commercial, economic and industrial development in Japan since 1870
S15	History	Chinese	English	M	The geographic distribution of temples in China in the Qing dynasty
S16	Modern languages	Spanish	Spanish	F	Instructional technologies used in teaching Spanish

Table I.
Characteristics of subjects

Faculty known to the researchers were first contacted from local colleges and universities, resulting in nine subjects. Snowball sampling – whereby those contacted initially recommended others – resulted in the identification of three more participants. Some cold calling via e-mail was used to contact language or history scholars from nearby institutions, with names being derived from the institutional websites, identifying the remaining four subjects.

Data collection methods and procedures

Data were collected from the subjects using questionnaire, pre- and post-interviews and a research diary. Pre- and post-interviews were conducted with each subject using a semi-structured interview technique: one at the beginning of the study period and one at the end. A diary was used in place of direct observation to document what ISSs were used by scholars during the study period.

First, subjects signed a consent form and filled out a brief demographic questionnaire. Second, pre-interviews were conducted consisting of questions about the subjects' areas of research, their usual methods of finding and acquiring information sources, and common challenges related to language. Third, subjects were instructed to keep a diary for six to eight weeks to record the resources and strategies they used during their information seeking process. Table II presents the sample diary. Fourth, the post-interviews focussed on questions about the ISSs they used during the specific research period, language-related challenges and how they overcame them, as well as questions about what advice they would give to other researchers, system and resource designers, and libraries about how to best conduct or support research similar to theirs. All interviews were conducted in person and recorded with a digital voice recorder with the subject's permission. At the time of the final interview, the researcher collected the research diaries.

Data analysis

Data were analyzed throughout the course of the study using grounded theory and the constant comparative method (Glaser, 1965; Glaser and Strauss, 1967). While it is tempting to combine or divide certain strategies to make them fit more neatly into existing models, the model presented by this study emanates from the data rather than trying to fit the data into an existing theoretical model.

Recorded interviews were transcribed and coded, as were the diaries, and quotes were extracted. Data regarding strategies, problematic situations, and shifts were recorded onto coding sheets either while listening to the interview recordings or reading the transcripts, and themes were identified. The list of strategies derived from the study is shown in Table III. Coding of the strategies included special attention to

Date/amt of time	Type of resources used	Specific tools, people or sources consulted	Research process specifics	Significant events	Outcomes and notes
				New source Obtain source New lead Eliminate source Change direction "Ah-ha moment" Other	

Table II.
Sample diary portion

Strategy	Category	Definition
Search scholarly databases	Formal	Searching for scholarly articles in periodical databases such as Ebsco, Jstor, Project Muse, ERIC
Search the web using a search engine	Formal	Using a web search engine such as Google to search for relevant web documents
Search library OPACs and online archives	Formal	Searching for books and primary source documents using a library online public access catalog or online finding aids
Search Google Books or Scholar	Formal	Using Google Books and Google Scholar
Browse libraries or archives	Informal	Browsing collections in a library or archives
Trace citations from secondary sources	Informal	Following the footnotes, citations, and bibliography of one source (often called a seed document) to identify other useful sources
Consult known websites with static resources	Informal	Consulting websites known to the researcher, including static library indexes, listings, finding aids
Utilize items in private collections	Informal	Using materials already in the person's own possession
Read newspapers (online or print)	Informal	Using subject indexes and bibliographies
Browse or consult bookstore	Informal	Visiting, browsing, or consulting bookstores
Identify sources from conference papers and proceedings	Informal	Utilizing conference papers and proceedings to identify sources
Consult a colleague or other human	Human	Consulting with a known person by means such as e-mail, phone, in person, etc.
Interview primary human resources	Human	Conducting interviews of humans as primary sources
Request assistance from a librarian or archivist	Human	Ask for help from a professional librarian or archivist
Attend a conference and interact with participants	Human	Attending a conference and interacting with presenters and/or presentation
Request an item be delivered from another library (ILL)	Hybrid	Requesting materials through inter-library loan service

Table III.
Information seeking strategies, categories and definitions

which strategies appeared either first or last. Initial strategies are of significance because they are the ones specifically chosen by the subjects because they believe that those strategies will be effective in advancing the resolution of their information need. Final strategies are of the most interest because they most often indicate the successful resolution of the subject's information need. The common characteristics of the strategies were used to classify them and construct the information triangle.

Shifts were coded according to the types of situations that caused them based on Xie's (2008) coding scheme, as shown in Table IV. This study does not make a distinction between Type III and IV shifts because the party that initiates the shift is not a significant factor.

To ensure inter-coder reliability, two researchers went through the transcripts of the strategies and shifts. When there were disagreements on the types, the two researchers discussed perspectives until an agreement was reached.

Results

The findings of this study are presented according to the research questions: first, types of ISSs used by scholars; and second, types of shifts in strategies made in

routine, disruptive, and problematic situations. Many more cases of strategies and shifts exist; the cases presented here were deemed to be most illustrative of the corresponding concept.

Types of ISSs

RQ1 asks what information-seeking strategies are used by scholars conducting research in languages other than English. A list of strategies was created as described above, and each strategy was classified according to its place on the information triangle. Since the list was created inductively from the gathered data, it may not include all strategies enumerated in past literature.

Four formal system strategies were identified, the most common of which was searching the web using a search engine. The next most common formal system strategy was searching scholarly databases, followed by searching in library OPACs. Finally, several scholars indicated that they used the strategy of searching Google Books or Google Scholar. These resources are considered as a separate strategy from using the Google search engine by our subjects because they consider the content to be a distinct entity from both general web resources and academic databases such as those provided by libraries.

Seven distinct informal resource strategies were mentioned by the subjects; the most often cited was tracing citations from secondary sources. Nearly as common was the informal resource strategy of browsing libraries or archives. Less commonly used informal resource strategies included consulting known websites with static resources and visiting and browsing or consulting bookstores. Perhaps surprisingly common was the strategy of identifying sources from conference papers and proceedings, especially to find out what research scholars in the target country are doing. A few subjects listed the informal resource strategy of utilizing items in private collections, while a handful of subjects also mentioned reading newspapers (online or in print) from the target country.

Four interactive human strategies were listed by our subjects. Most commonly used was consulting with a colleague or other human. Equally popular was the interactive human strategy of attending a conference and interacting with presenters or participants. Similar to consulting with colleagues, but less commonly cited, was the strategy of asking for help from a librarian or archivist. Finally, some of our subjects relied on conducting interviews of humans as primary sources.

This study identified one strategy that was difficult to classify on the information triangle and so is considered a hybrid strategy. This is the strategy of requesting an

Shift	Situation	Definition
Type I – planned shifts	Routine situations	Scholars shift between strategies (and sides of the information triangle) according to common research habits and planned research threads developed through their formal education or experience
Type II – opportunistic shifts	Disruptive situations	A scholar using one strategy makes a positive serendipitous discovery that leads them to another strategy
Type III – assisted shifts Type IV – alternative shifts	Problematic situations	Barriers and obstacles lead the user to a point where their chosen strategy is not yielding the needed information so he/she must choose another strategy to continue

Table IV.
Types of shifts and the types of situations that cause them

item be delivered from another library using inter-library loan. This might involve filling out an online form, a paper form, sending an e-mail, or talking to a library employee.

The specific counts of the strategies by participant are given below in Table V. Note that searching the web is the most commonly used strategy and, although it is most commonly used first as an initial strategy, it is also fairly common as a final strategy, meaning that it can be the strategy which results in successful acquisition of the needed item or information. Searching scholarly databases, on the other hand, is only used as an initial strategy, and searching OPACs is nearly always an initial strategy. This means that those strategies alone are rarely sufficient to both identify and obtain the needed source and need to be followed by a shift to another strategy. Meanwhile, the informal resource strategy of browsing in libraries is a very common initial strategy as well as being one of the two most common final strategies. The hybrid strategy of borrowing items through inter-library loan is just as common and only used as a final strategy.

The total counts of the initial and final strategies, according to their place on the information triangle, are shown in Table VI.

Types of shifts and the types of situations that cause them

The second research question asks what shifts scholars make from one strategy to another in specific types of situations. Our analysis broke down the reported shifts according to the type of strategy (formal systems, informal resource, interactive human) and the situation and shift type (routine/planned, disruptive/opportunistic, problematic/assisted-alternative). Subjects indicated that planned shifts are quite common, especially the pattern of using formal system strategies to indentify a seed document or source and then shifting to the informal resource strategies of either library browsing or citation tracing to leverage that discovery into additional useful sources. In disruptive situations, strategies based on browsing and interacting with people at conferences are most commonly credited with causing opportunistic shifts, and the term serendipity was a recurring theme. The most common cause of problematic situations was the inability to obtain the actual item they needed at the acquisition phase, often because it was only available in the target country; this which most frequently led them to shift from search-based formal system strategies to the hybrid strategy of requesting the item from another library (ILL) or using interactive human strategies.

Planned shifts in routine situations

All subjects cited numerous strategies that they commonly use in their various research projects, and many outlined their usual progression of strategies which represent planned shifts in routine situations. Subject S10 explains her usual thread of strategies as starting with a formal systems strategy of searching scholarly databases like Project Muse, MLA, and others then shifting to the informal resource strategy of visiting a library to consult these and identify "the main books that I have to read, of course, like the novels." She explains why she prefers visiting the library over using the formal library databases remotely via the internet:

> And then I go to the library and, it always happens – and I tell my students this all the time – that you have to go physically to the library, even though we are surrounded by so many media and Google and things like that. But when you go there, you always find [many] books […] that helps you. So I do that, too.

Table V.
Strategies by subject

Subject				S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16
Strategy/language	Type	Ini	Fin	Sp	Ge	ItLa	Sp												
SpCh	Ru	Ja	Ur	Sp	Sp	Ge	Ge	Ru	Ja	Ch	Sp								
Search web using search engine	For	9	4	Ini	All				Ini	Ini		All			All	Ini	All		Ini
Search library OPACs	For	3	1		Ini	Fin					Ini				Ini				
Search scholarly databases	For	8	0		Ini	Ini		Ini		Ini			Ini	Ini	Ini				Ini
Search Google books/scholar	For	5	0			Ini			Ini					Ini	Ini				Ini
Browse libraries or archives	Inf	7	8	All	Ini	All			All		Fin		Fin			All	All	All	
Trace citations from secondary sources	Inf	8	2	Ini	Ini	Ini	Ini		All				Ini		Ini		Fin	Ini	
Identify sources from conference papers/ presentations	Inf	4	0							Ini				Ini	Ini				Ini
Consult private collections	Inf	2	3	Ini		Fin		Ini		Fin							Fin		
Consult known websites	Inf	4	1		Ini		Ini			Fin				Ini				Ini	
Browse bookstores	Inf	4	0					Ini		Ini			Ini				Ini		
Read newspapers	Inf	3	1				Ini			Ini		All			Ini	Ini			
Request assistance from a librarian or archivist	Hum	3	1														Ini	Ini	All
Consult with a colleague or other human	Hum	8	3	All		Ini			All	Ini	Ini		Ini			Ini	Fin	Ini	
Attend a conference and interact with participants	Hum	8	1	Ini					Ini		Ini		Ini	All		Ini	Ini	Ini	
Interview primary human resources	Hum	4	1				Ini			Ini	All				Ini				
Request an item be delivered from another library (ILL)	Hyb	0	8	Fin	Fin	Fin								Fin	Fin		Fin	Fin	Fin
Other: A = Wikipedia, B = Amazon, C = company histories, D = transcripts of previous interviews or diaries, E = government recs and stats, F = popular magazines, G = browse museums, H = publisher's catalogs, J = news magazine, K = films, L = popular magazines, M = audiobooks, N = blogs				F	A, B, H	G		H,L, M	K,E	E	D	F			E,J	E,N G D	C,D		

This is an example of a multi-dimensional shift in both method and entity. Subject S10 makes this shift because she anticipates that browsing in the library will lead to serendipitous discoveries of other useful sources physically nearby.

Subject S6 describes her most common chain of strategies for beginning her research:

> When it's a completely new topic, then I start searching online. That would be the first step. Then I usually identify key players, the gatekeepers, and then I do, and I do usually, I often e-mail. I establish contact with these people, and then we also have an exchange.

The progression she describes shows a planned shift from the formal system strategy of searching, although it is unclear if she is searching library resources or the world-wide web, to the interactive human strategy of consulting with colleagues or other humans.

Subject S14 is one of several subjects who discuss visiting bookstores as an informal resource strategy. While most subjects explained that they go into bookstores primarily to browse through popular literature and find out what people in that culture are currently reading or to find recent titles on a broad topic, S14 tells us how he shifts from that strategy, which uses the method of scanning (browsing) and the entity of item/object/site to the method of consulting and the entity of a human and then back again to browsing the materials. This research thread takes place in the target country and would most likely not be possible in the USA, especially in the scholar's home location in the Midwest:

> I was in Japan and started pursuing a different topic, and that's the Tokyo Olympiad in 1964. And Japan has clusters of bookstores – all have their own unique specialties. And it's a matter of walking in one at a time and asking them "Do have this?" and as it happened, a great many of them did have a good amount of really valuable material: news media publications, special magazine editions, programs and so forth, that had been published for the games – souvenir programs and so forth – and that was really a treat.

Opportunistic shifts in disruptive situations

Research does not always proceed as planned, and many of the subjects spoke directly of serendipity and how disruptive situations led to opportunistic shifts. Subject S15 had traditionally followed the informal strategy of visiting libraries at the University of Washington or Berkeley to access primary sources he needs for his research on the geographic distribution of temples in China throughout the Qing Dynasty. He observes how recent changes in technology allowed a shift from an informal resource strategy to the formal system strategy of online searching in library collections and/or digital libraries as viable options for his research:

> I wrote a paper on this earlier while I was pursuing my Masters. And I've always wanted to go back to it, but I thought that we didn't quite have the tools that would make it really interesting or profitable. And I just found last year two online databases of the types of journals – we call them "gazetteers" – that I can use for this project.

This demonstrates a shift in entity from a library print item to an online resource.

Table VI. Strategies counts by initial and final strategies

Strategy type	Formal systems	Informal resource	Interactive human	Hybrid
Appears as an initial strategy	25 times	32 times	23 times	0 times
Appears as a final strategy	5 times	15 times	6 times	8 times

Subject S10's fortunate discovery did not result from new technologies but rather from finding an item through the formal systems strategy of using Google Scholar that exceeded her expectations and allowed her to successfully leverage and shift to the informal resource strategy of citation tracing – an example of a method-entity shift:

> But, the footnotes […] I started precisely four days ago reading an article about linguistics and how this poet uses the language. And it's something […] I don't know about linguistics too much, not at all. So it was fascinating; it was hard to read; and the footnotes helped me so much. Because when I read it and then I went to the footnotes and I went to the bibliography of this author that was talking about Candelario Obeso – the poet I'm working on […] Oh, I found like this guy did the research for me. So now I know what has been published about this poet. And that was very, very good for me, because this article is from September 2011. And I found it in Google Scholar. I found all this bibliography that I didn't know about. So going to the bibliography of the last articles that have been published and of people that you trust, of course, that you think, well, they are good scholars.

Another example of an opportunistic shift in both method and entity is given by subject S2 when working on his primary research topic of a specific author – moving from surveying a specific item using bibliographic tracing to actually visiting and scanning/browsing a key archive in the target country that specializes in materials on his topic:

> I do like to look at archives, and one archive that I discovered was purely by accident. I just happened to see somewhere in a footnote somewhere about this archive, and it's an archive that has the collected papers of the author […] the main author that I work on.

Assisted or alternative shifts in problematic situations

Not all shifts in strategies are planned or the happy consequences of fortunate discoveries. In fact, most unplanned shifts are a result of barriers that researchers experience in their process. These problematic situations cause either assisted or alternative shifts. In this study, no distinction is made between these two types of shifts since the focus is on the nature and of the problematic situation rather than the entity that suggests the shift. Subject S16 describes a common problematic situation in which the unavailability of non-English documents on-line causes a shift from the formal systems strategy of searching scholarly databases to the interactive human strategy of consulting with a librarian. This example shows how the scholar may use an interactive human strategy with the human intermediary in turn using a formal systems strategy of searching scholarly databases, a hybrid strategy of requesting an item from another library using inter-library loan, or a subsequent interactive human strategy of contacting a colleague or other human:

> The Internet really works beautiful. So when I don't find anything, I go to the Internet, and then I get it. If I don't get it from there, then the library. They are very helpful. So they try, they go and they try and show me. What's the name […] *Proquest* […] they find […] They go to Google Scholar and Books, and they find the books. And the book is perhaps in Germany or in Spain; and they e-mail them, and they request chapters. They fax sometimes on paper and sometimes electronic file.

Subject S1 describes a situation where, at the acquisition stage, no formal system strategy allowed access to the item, so a list of interactive human and informal resource

strategies are pursued which may or may not yield the desired results. Depending on the chain of events, this situation may cause multiple strategy shifts that include shifts in entity and possibly method:

> We deal with publishers who get books, like a middleman. There are distributors in New York and sometimes they're good and fast and sometimes they're not. So sometimes it's something you really, really want, and the publisher is in Argentina. And so I generally try to make it go faster. I try to get it through interlibrary loan. If it's unavailable via interlibrary loan, which most of the time it isn't, I go to our bookstore and I say "see what you can do with the distributor," and see if they can get one personal copy for me. So that's the way I generally go about it, but it's not that bad in Spanish as maybe in other languages […] In those instances, as I recall, I can e-mail somebody in the country and say "Look for this for me, and put it in the mail and I'll pay you."

Our subjects commonly explain that the last resort to locate or acquire a hard-to-find source is the interactive human strategy of contacting colleagues or other humans in the target country. In the case of Spanish, where two of our six subjects speak Spanish as their native language, three of them speak English, and one speaks Chinese, all subjects reported similar barriers in obtaining sources from foreign countries. This was also true regardless of whether the subject was seeking sources from Spain, Latin America, or South-America.

They also point out that, when contacting a human in a foreign culture, a scholar may need to pursue a shift in methods in order to get what they need. This is illustrated by subject S9 when explaining how she tried to get permission to use a specific article from a foreign newspaper and contacted the responsible person via e-mail:

> We would try to get permission to use things that came out in an Argentine newspaper or Mexican newspaper, and we would send them e-mails and send them e-mails and send them e-mails, and they would never respond. And one time out of frustration, I actually called long distance. It was a really long process. I can't remember how many phone calls I had to make before I finally was connected to the person who was in charge of permissions for this Argentine newspaper that I said "Hello" (in Spanish), and I said "I need to talk to you about permission to use an article" and she said she said "Oh, you sent me lots of e-mails!"

Several subjects expressed the recurring theme that scholars need to take the time to discover what types of human communications work best in order to approach foreign library staff, publishers, authors, and others. While it might seem that being a native of the target culture would be an advantage, the native speaker subjects in our study related examples of cultural barriers similar to those experienced by non-native speakers. Scholars have clearly come to understand how shifts in human communication methods from one culture to another can spell the difference between success and failure.

Discussion

This study specifically sought to identify and classify the strategies deemed most effective by scholars conducting research in languages other than English and to identify, classify, and understand the shifts that these scholars make between strategies. This section focusses on the discussion of the role of language in scholar's selection of information seeking strategies and shifts between strategies.

Analysis of strategies

The first area of analysis is the choice of strategies made by scholars in this unique group of subjects. In looking at the list of strategies presented in Table III, shown earlier, most of them overlap with strategies identified in previous studies. It is worth

noting, however that several previous studies, including those of Ellis (1992), included the strategy of "chaining forward" – often called "indentifying citing sources" by lay persons – but none of our subjects indicated that they used this strategy in their research. In contrast, the subjects of this study also frequently cited the use of items from their own personal collections as a significant strategy, often in the middle of an information seeking thread. This strategy is not often identified in other studies. Additional strategies that are fairly unique to this study include "browsing or consulting a bookstore," "identifying sources from conference papers and proceedings," and "consulting known websites with static resources."

While not all of the specific strategies chosen by scholars using languages other than English are unique in themselves, the frequency with which they are chosen is. In routine situations, six of the 13 cases in this study (or 46 percent) started their research threads with formal system strategies. Strategies chosen as initial strategies by scholars are those they believe will be most effective in satisfying their information need and/or advancing their information seeking process. Studies conducted by OCLC in 2005 and 2006 (De *et al.*, 2011) with multiple user types and task types found that 84 percent of users consciously chose to start their information seeking process with searching. The difference between the scholars in this study and the OCLC studies could be attributed to several factors, including the probable complexity of the task, the experience of the researcher, the language of the needed information or any of the factors mentioned previously. Herring (2001) and Connaway *et al.* (2011, p. 188) conducted studies related to ease of use as a factor in selecting information seeking strategies and conducting research, finding that, "in some situations information seekers will readily sacrifice content for convenience." The subjects of this study more often cite efficacy, prior training, past experience, and habit over and above ease of use as a rationale for their strategy choices and planned shifts. Herring's study specifically found that faculty in the area of language and literature were the least satisfied with web searching as a strategy compared to faculty in various other disciplines.

In contrast to initial strategies, final strategies are those that actually satisfy the scholars' information needs, thereby ending the information seeking process. While these final strategies may not have been successful on their own, when used at the end of an information seeking thread, they are the strategies that result in the acquisition of the source. The results of the study indicate that informal resource, interactive human, and hybrid strategies occur more often and, because of the information seeking contexts in our study, they can be considered more "language proof" than formal system strategies. As shown in Table V, informal resource strategies are used as final strategies five times as often as formal system strategies; interactive human strategies are used 20 percent more often; and the one hybrid strategy is used 60 percent more often as a final strategy than all formal system strategies combined, pointing to their language-proof nature.

Analysis of shifts

The second area of analysis is that of documenting and describing the shifts made between strategies by scholars in routine, disruptive, and problematic situations. In order to visualize these shifts, it is helpful to map them to the information triangle as shown in the examples below. The arrows in the diagram indicate the type of shift (routine, opportunistic, or assisted/alternative) as well as the direction of the shift and the strategies between which the shifts occur.

Planned shifts made in routine situations are shown in Figure 2. The routine situation described by subject S10 began with the formal strategy of searching scholarly databases and led her to shift to visiting and browsing her local library. In subject S6's routine situation, she would begin with internet searching and then contact the authors and/or website owners by e-mail. When using an initial strategy of web searching, subjects S11 and S9 indicate that they make planned entity shifts to the informal resource strategy of browsing a known website such as an online newspaper. Subject S14 describes a planned shift where he transitions from browsing in a bookstore to the interactive human strategy of consulting with a human in the bookstore to identify and acquire useful materials. Subject S11 often pursues a planned shift that begins with the interactive human strategy of interacting with people at conferences and ends up with use of his own private collection.

The significance of the language role demonstrated here is the direction of the shifts. Of the five planned shifts mapped to the triangle in Figure 2, three begin with formal system strategies but none end there. The subjects' most common explanation was that they identified a source by searching either scholarly databases or the web, but they needed to acquire the source by another method. The implication is that these non-English, non-US sources are not often available in full text electronically and require more effort and often different strategies to obtain. One planned shift begins with an informal resource strategy, and three shifts end with them, indicating that informal strategies are very often effective to satisfy the scholars' information needs at the acquisition stage. Finally, one shift begins with an interactive human strategy, and two shifts end there. This pattern generally occurs because human intervention is required as a final step to obtain a hard-to-acquire overseas source.

Opportunistic shifts made in disruptive situations, less common, are shown in Figure 3. Two subjects describe the disruptive situations that led to their opportunistic shifts: Subject S15 shifted from visiting library collections to the formal systems strategy of online searching because the materials he needed had been put online, and subject S2 traced a citation in an existing document that led him to another informal resource strategy of visiting and using an archival collection. This latter example is a very

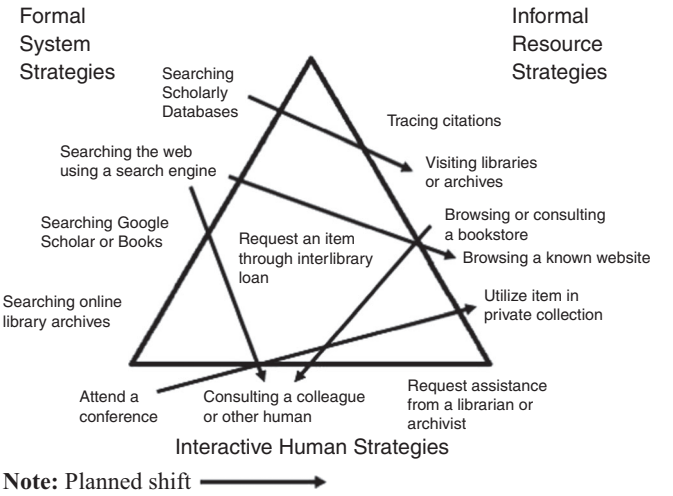

Figure 2.
Examples of type of planned shifts

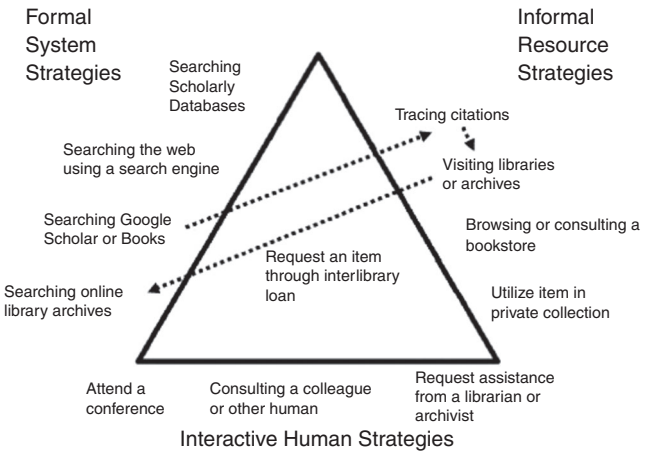

Figure 3.
Examples of opportunistic shifts

common progression, especially among scholars using primary sources, and demonstrates one of Green's (2000) observations that citation tracing is popular with humanities scholars because of their preference for primary sources. Since archival collections are seldom as easily searchable as secondary or web sources, one often must learn about them either through informal resource or interactive human strategies. In the case of opportunistic shifts, it is important to note that the language, culture, and geography do not cause the shifts, but they play a role in the information seeking context that makes a serendipitous discovery more significant than in other, more conventional situations. That two of the three opportunistic shifts documented in Figure 3 begin with an informal resource strategy demonstrates what prior studies have maintained – that browsing activities are effective in uncovering unplanned connections.

Of most interest to this study are the alternative shifts made in problematic situations, shown in Figure 4. In problematic situations encountered by subject S16,

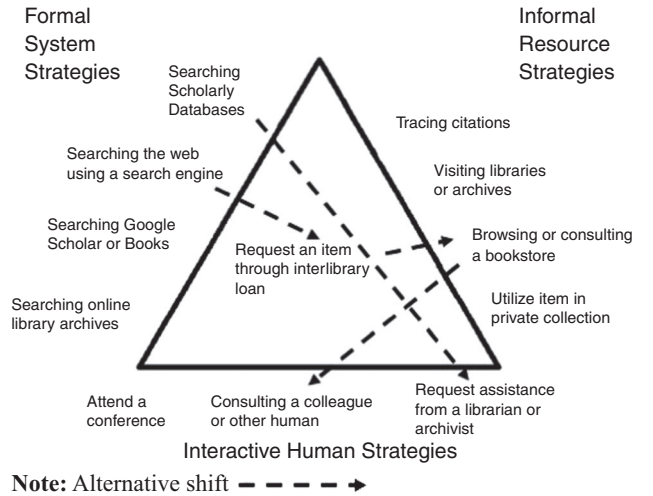

Figure 4.
Examples of alternative shifts

she could not obtain the actual item that she identified from a scholarly database, so she made alternate shifts to the hybrid strategy of using inter-library loan or to the interactive human strategy of asking for help from a librarian. In a similar problematic situation related to acquiring a source, subject S1 took a more circuitous route, starting by trying the hybrid strategy of inter-library loan. When that did not work, she consulted her university bookstore to put in a request to the publishers. When that was unsuccessful, she contacted a colleague in the target country to send her the source directly.

These types of problematic situations were described often by the subjects of this study at the acquisition phase of their information need. Scholars who need materials that are not in English or found in the USA find them difficult to acquire, and when formal system and informal resource strategies fail, they rely on human intermediaries to provide needed documents. Of the subjects in this study that reported consulting librarians as intermediaries for retrieving documents, the success of that strategy was mixed. Some subjects had rave reviews of their librarians' abilities to acquire documents; others were dubious. All stated that they had no expectation that their university librarians speak the target language, although most would put that on their wish list of services. Kellsey (2003) corroborates the problems observed by the subjects in this study regarding both the unavailability of non-English sources through normal library channels and the lack of foreign language expertise among librarians in general.

Data analysis from this study point to several conclusions:

(1) Formal systems strategies that involve searching can be a good place to start, but they are not the only effective initial strategies. Beginning one's research by attending a conference, browsing a collection, or tracing citations from known sources can be equally effective. Most of the subjects of this study were aware that much of what is written in languages other than English is not yet searchable or accessible electronically because budgets, bureaucracy, lack of infrastructure and cultural phenomena can impede or even preclude efforts to digitize and index them. Based on this awareness, the subjects in this study often choose strategies deemed to be more "language proof," primarily informal resource and interactive human strategies. In the initial resource identification stage, subjects pointed specifically to strategies of citation tracing, use of private collections, browsing in libraries and archives, direct human contact, and conference attendance as highly effective regardless of the language being used. Green's (2000, p. 222) study further explains how citation tracing is highly effective for scholars and why it can result in higher precision and recall than formal searching strategies. "In general, bibliographic tools observe well-defined boundaries of coverage relative to subject, date, format, and language. But the literature relevant to a question may not respect the same boundaries, especially in the humanities."

(2) Language, culture, and geography play significant roles in the information seeking context and often create problematic situations, especially at the acquisition phase of research. When sources are not available in formal systems such as scholarly databases, scholars must often turn to interactions with humans or accessing resources through informal strategies such as visiting remote physical collections. In their study of scholars researching stateless nations, Meho and Tibbo (2003) corroborate the findings of this study regarding the difficulty of obtaining source documents from distant countries. Those subjects and the subjects of this study both often shifted from formal system

strategies to the hybrid of inter-library loan, informal resource strategies such as visiting library collection, or interactive human strategies such as contacting colleagues in order to obtain the needed materials.

(3) Formal systems are gradually incorporating techniques often associated with informal resource strategies such as providing direct links from a journal article in the database to the items cited in its footnotes or providing an inter-library loan interface within an OPAC. However, formal systems are rarely if ever credited with providing a direct link to an interactive human source or strategy. While some systems may offer a live chat with a librarian, rarely if ever do they provide a direct link to the author or other expert on the subject.

By better understanding the information seeking behaviors of scholars who utilize resources in languages other than English, system designers, publishers, aggregators, and support providers can better meet the needs of this distinct group. System, content, and support providers should specifically strive to:

(1) Support the planned shifts that scholars most often make. This includes tracing citations from an article found by searching, contacting a person related to a publication, browsing other similar items, and so on.

(2) Facilitate serendipitous discoveries. Since serendipity is most often associated with browsing and scanning activities, systems and mechanisms that present items for browsing may create disruptive situations that lead to opportunistic shifts.

(3) Enable assisted shifts when problematic situations arise. When barriers of language, culture, or geography prevent successful identification or acquisition of the desired resources, our subjects most often had to make their own shifts, choosing alternative strategies without assistance from the system or resource being consulted. Systems that present alternate resources and options based on an understanding of these barriers would likely make researchers more successful and efficient.

Conclusion

While the results of the study are very helpful in identifying the information seeking strategies used by scholars who rely on non-English sources and the role that language plays in the situations that prompt strategy shifts, its primary limitation is related to isolating the variables of language, culture, and geography from other possible factors such as the searcher's domain knowledge, their system knowledge, and/or limitations of the systems or resources being used. Future studies should bring out additional evidence from multiple data collection methods to support the conclusion that language plays a direct and observable role in the information seeking context which, in turn, causes shifts in ISSs to satisfy the scholar's information need, especially at the stage of resource acquisition. In addition, the sample size can be expanded to have a better representation of scholars and to allow for quantitative data collection and analysis as confirmation of the qualitative observations. Confirmatory quantitative statistics should be gathered to determine which strategies are most often used in what situations. The strategies used and shifts between strategies made by scholars using non-English sources should then be compared to strategies and shifts applied by scholars engaged in information seeking in general to determine by comparison if some specific strategies truly are more "language-proof" than others.

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