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What is enough? Satisficing information needs

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Abstract

Purpose – This paper seeks to understand how users know when to stop searching for more information when the information space is so saturated that there is no certainty that the relevant information has been identified.

Design/methodology/approach – Faculty, undergraduate and graduate students participated in focus group interviews to investigate what leads them to satisfice their information needs.

Findings – Academic library users describe both qualitative and quantitative criteria, which lead them to make rational choices determining when "enough" information satisfices their need. The situational context of both the participants' specific information need and their role in academic society affects every stage of their search – from the selection of the first resource, to ongoing search strategies, to decisions on how much information is enough.

Originality/value – These findings broaden the scope of earlier user research, which tends to focus on the more static views of habitual information-seeking and -searching behavior, by applying theoretical frameworks for a richer understanding of the users' experiences.

Keywords User studies, Academic libraries, Information retrieval, Consumer behaviour

Paper type Research paper

Introduction

The current information environment is rich, characterized by a proliferation of information sources and providers, a multiplicity of methods for accessing information, and a redundancy of content from multiple sources. In this "overloaded" information environment, many information users tend to experience a sense of information inadequacy and anxiety. How do individuals navigate this complex landscape of information? Furthermore, how do individuals assess the information they find as being enough to satisfy their specific need? In this complex information environment, understanding how individuals choose to satisfy their information needs takes on new urgency. Insight into information seeking can be gained by understanding how users seek information sources and how they choose content to meet their needs. Yet the library and information science literature has neglected to study how individuals decide what and how much information is enough to meet their needs or goals.

Research on information-seeking and -searching behavior has paid ample attention to sources of information sources used. The process of seeking and searching for information also has received considerable attention from researchers, resulting in

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several models, many of which are centered on information seeking and searching in academic or professional settings. Though the models delineate the processes, they have not shed much light upon how users recognize what or how much information is enough to accomplish their objectives.

The present article extends the information-seeking, -searching, and -gathering process to include how and when individuals stop looking for information, given a goal or a task that creates the need for information. Individuals are motivated to seek information to satisfy their needs (Wilson, 2005). Given the information glut, how do individuals manage information in such a way as to provide a sufficient answer? This, in essence, is what is meant by satisficing. Satisficing, as defined by Herbert Simon (1955), may be applied to library and information science as an information competency whereby individuals assess how much information is good enough to satisfy their information need. Scholars from different fields have drawn on the satisficing concept to reflect on the "contrast between choosing what is satisfactory and choosing what is best" (Byron, 2004, p. 1).

To amplify this central thesis relating satisficing to search-stopping behavior, this article presents examples of satisficing information needs in relation to the academic tasks that create a need for information in the first place. Role theory and rational choice theory provide a framework for understanding why users decide to stop looking for more information when searching for information to meet their needs.

Role and rational choice theories in human information behavior

Both role theory and rational choice theory are attempts to explain human behavior. Role theory explains individuals' preferences by situating their search for information in a social context within a social system (Mead, 1934; Marks and MacDermid, 1996). Rational choice theory, on the other hand, addresses how individuals decide how much effort is needed to find information in order to accomplish their objectives.

Role theory

The term role has its origin in theatre as a part played by an actor, which was written on a roll of paper (Biddle and Thomas, 1966). The term began to be used in a technical sense in the 1930s when social scientists recognized that social life is akin to theatre where actors play their "predictable" roles (Biddle and Thomas, 1966). More cogently, role theory explains that: "When people occupy social positions their behavior is determined mainly by what is expected of that position rather than by their own individual characteristics" (Abercrombie *et al.*, 1994, p. 360). George Herbert Mead (1863-1931), Ralph Linton (1893-1953), and Jacob Moreno (1889-1974) contributed to the development of role theory (Borgatta and Montgomery, 2000). Each attempted to explain behavior from their distinct disciplinary perspectives. Mead, who approached it from a philosophical perspective, viewed roles as coping strategies that individuals learn as they interact in society. Linton, who studied from an anthropological angle, distinguished status from position in playing a role. Moreno, who studied from the viewpoint of a psychologist, saw roles as habits and tactics that individuals learn. In effect, "Roles provide behavioral guidelines, prescriptions or boundaries in the form of expectations" (The Gale Group, 2001). Role theory acknowledges the particularity of the situation including personal motivations, perceptions of information needs and priorities for information seeking (Mead, 1934; Blumer and Morrione, 2004).

Including the information-seekers' social role helps to understand how individuals seek information in different roles. However, role theory does not explain individual differences seen among those playing the same role. Rational choice theory, on the other hand, is useful in this pursuit because it addresses how individual incentives and intentions influence the information choices users make.

Rational choice theory

The origin of rational choice theory has been traced back to logic, mathematics and statistics, although much of it developed in economics (Green, 2002). Rational choice theory is based on the premise that complex social behavior can be understood in terms of elementary individual actions because individual action is the elementary unit of social life. Rational choice theory posits that individuals choose or prefer what is best to achieve their objectives or pursue their interests, acting in their self-interest (Green, 2002). Stated another way, "When faced with several courses of action, people usually do what they believe is likely to have the best overall outcome" (Scott, 2000).

Rational choice theory does not specify that all individuals work toward (or even desire) similar goals, nor do they assess costs and benefits similarly. Rather, actors assess "costs" and "benefits" according to their own "preferences, values or utilities" (Friedman and Hechter, 1988, p. 202). In other words, individuals "act with the express purpose of attaining ends that are consistent with their hierarchy of preferences". Rational choice theory has been adopted by several fields including anthropology, political science, psychology, consumer behaviorism, and sociology.

Sociologists use rational choice theory to explain human behavior in terms of individuals' goals and motivations (Green, 2002). In its purest form, rational choice theory assumes that it is possible to know and evaluate all of the possible choices. According to this theory, individuals compare the expected benefits they derive from taking various courses of action in pursuit of their objectives and then choose one that promises to maximize the benefits relative to the effort or cost required. In economics, individual actions that are based on individual preferences are defined as rational if they can consistently compare expected benefits from all of the alternative courses of actions. In other words, individuals make a cost-benefit analysis prior to selecting the optimal course of action to achieve a desired goal (Wikipedia, 2006).

In many real-life situations, individuals may not have at their disposal the full range of all possible choices with which to assess and compare the benefits of each choice in relation to the effort or cost; therefore, the premise of rational choice theory has been challenged and debated widely by scholars. Simon (1955) proposed the concept of satisficing, recognizing that in many situations it is neither possible to know the entire spectrum of options, nor is it possible to compare the benefits each may offer. In practice, satisficing translates into a judgment that the information is good enough to satisfy a need even though the full cost-benefit analysis was not performed.

Satisficing

Simon defines satisficing as a decision-making process "through which an individual decides when an alternative approach or solution is sufficient to meet the individuals' desired goals rather than pursue the perfect approach" (Simon, 1971, p. 71). When individuals satisfice, they compare the benefits of obtaining "more information" against the additional cost and effort of continuing to search (Schmid, 2004). In fact, in

many organizations, "problems are considered resolved when a good enough solution has been found, that is the manager satisfices as she looks for a course of action that is satisfactory" (Choo, 1998, p. 49). Theoretically, decision makers consider all potential alternatives until the optimal solution emerges (Stroh *et al.*, 2002). However, such an exhaustive analysis would require additional time and expenditure which information seekers must weigh against the likelihood that they will find additional information of sufficient value to offset the cost of continued searching. The consequences of putting time and effort into finding optimal solutions can be costly; therefore, "decision makers must be willing to forgo the best solution in favor of one that is acceptable" (Stroh *et al.*, 2002, p. 94). In so doing, information seekers "...satisfice...and choose the one [solution] that produces an outcome that is 'good enough'" (Stroh *et al.*, 2002, p. 94).

The foregoing examples suggest that users may satisfice their need for information based on what they are able to find and thus stop looking for more information. Users may also stop looking for information prematurely if the information systems are difficult or unusable.

The very abundance of information makes it crucial for information seekers to decide what information is enough to meet their objectives. This paper examines the theoretical concepts – role theory, rational choice, and satisficing – by attempting to explain the parameters within which users navigate the complex information-rich environment and determine what and how much information will meet their needs.

Previous studies and models on information seeking and searching

Studies

The information-seeking and -searching research that explicitly addresses the topic of "what is good enough" is scant, though several studies make oblique references to the stopping stage, or to the shifting of directions for want of adequate information. Kraft and Lee (1979, p. 50) propose three stopping rules:

(1) *The satiation rule*, "where the scan is terminated only when the user becomes satiated by finding all the desired number of relevant documents";

(2) *The disgust rule*, which "allows the scan to be terminated only when the user becomes disgusted by having to examine too many irrelevant documents"; and

(3) *The combination rule*, "which allows the user to be seen as stopping the scan if he/she is satiated by finding the desired number of relevant documents or disgusted by having to examine too many irrelevant documents, whichever comes first."

The stopping rules suggested by these authors imply an emotional or affective response to the nature of the retrieved documents or their surrogates and do not address the influence of role and rational choice theories and the concept of satisficing on information-seeking behavior.

Dalton and Charnigo (2004, p. 414) found that "several [historians] mentioned that they had called a halt to research when they felt they had enough to write, even if other sources promised to yield additional information. Some had tailored their research topics to minimize travel." This study illustrates how historians satisfice their search for information in the context of research. In another study of historians, Duff and Johnson (2002) note that time and money are important constraints on how much information historians can gather, which illustrates how Stroh *et al.* (2002) define

"acceptable". Lack of sufficient time and money clearly leads the historians in this study to settle or satisfice when they believe they have enough information to meet their objective.

Barrett (2005, p. 326) observes that "undergraduates employ a 'coping strategy' in their search for information, often seeking to find 'enough' information to fulfill assignment requirements with the 'least cost in terms of time or social effort'." This comment once again exemplifies how undergraduates (information seekers in a different role) satisfice their need for information. Barrett's study of the information-seeking behavior of undergraduate students excludes how graduate students satisfice.

Some attention has been given to the topic of how the situation influences users' decisions to determine what information is good enough (i.e. appropriate). Leckie *et al.* (1996, p. 185) found that when:

> [...] confronted with too much unevaluated information, engineers will often select sources based on authors they already know and have used, and lawyers will tend to use their notes from other cases, as well as familiar digests, citators, and other ready reference sources... It is often important that the information be obtained immediately or within an acceptable period of time. Its usefulness and impact will decrease if it is obtained either too early or too late.

Furthermore, they note that "the cost involved with accessing a particular source will also affect whether a professional decides to use it. The importance of the need, time factor, and monies available will determine how much effort and expense a professional will spend, seeking information from any given source" (Leckie *et al.*, 1996, p. 185). Although lawyers, as a professional group, fall outside the academic community, this example illustrates a practice of satisficing behavior. Meho and Tibbo (2003, p. 585) come to the following conclusion about the "ending stage" of research:

> The ending stage marks the end of the research cycle of a project. Although it is not discussed in this paper, an ending stage was assumed as all interview questions were geared toward discussing the entire research cycle of a project.

More importantly, they suggest that when researchers cannot find relevant information, they "try to use alternative sources or methods" (Meho and Tibbo, 2003, p. 585). In other words, Meho and Tibbo (2003, p. 585) report that these scientists are satisficing by "searching for new information...or continu[ing] working with whatever information had been obtained". However, they do not directly address the ending stage or the factors leading to it.

A very extensive analysis of "what is good enough" is undertaken by Zach (2005, p. 31), who found that senior arts administrators:

> [...] may reach the point of making the decision to complete the information-seeking process several times during the course of exploring an issue; they may then cycle through some or all of the steps one or more times before attaining the desired level of comfort with the results of the process. Sometimes it may be that additional information is necessary to provide greater clarity or understanding of the issue, but often it is that the administrator simply wants more time to process the input before taking the final step.

No administrator in the study applied predetermined criteria to make the decision to move forward to the next phase. The decision was made when the administrators felt satisfied with the inputs available to them or the decision was forced by external time

constraints. Sometimes the two primary factors – comfort and time – were in conflict with each other, in which case they often resorted to satisficing. Administrators also agreed that the type of task or decision influenced when they would stop the exploration process. However, the essential element of the decision to move on was the belief that they had enough information to complete the task or make the decision, even if they knew that more information might be available.

Models

Information-related actions begin with the recognition of the need for finding information to address a situation or solve a problem, and end when the individuals resolve the situation or abandon the pursuit. Understanding how individuals satisfice their need for information may be viewed as recognizing how much effort individuals are willing to invest in finding information, in relation to the trade-offs of information quality, time constraints for achieving an objective, solving a problem, or addressing a situation. Satisficing the need for information is an integral component of the larger body of literature on information-seeking and -searching models.

Library and information science research has identified several models for information-seeking and -searching behavior. A benchmark model, proposed by Taylor (1968), suggests that librarians consider users' objectives and motivations in providing answers information seekers will accept. Taylor's model recognizes that individuals evaluate information in relation to the objectives that create their need for information. Krikelas (1983, p. 13) suggests "that the characteristic of the problem may be a more critical indicator of potential behavior than various personal or work characteristics". In other words, the nature of the problem may indicate how much or what information is needed to satisfice.

Krikelas also discusses Voigt's (1961) model, which describes three types of information needs identified by scientists. The scientist's first type of information need is to keep current in relevant fields of study. The second need is the scientist's need for "some specific piece of information" (Voigt, 1961, p. 21). The third type of information need, which occurs with the least frequency, is the need for an exhaustive search – the need to find all of the existing relevant information on a specific subject or topic, as in the case of a dissertation topic (Voigt, 1961). The exhaustive search is the type that provides the scientist with enough information to determine that the search process can stop. The three types of needs – monitoring, finding specific data, and searching exhaustively – require varying amounts of search effort. By connecting the information need to the information problem, Krikelas, like Taylor, acknowledges that individuals decide how much information is needed in relation to the nature of the problem.

Marchionini (1995) observes that the determination of when to stop looking for information may depend on external functions like setting/context/situation or a search system or on internal functions like motivation, task-domain knowledge, and information-seeking ability. In other words, all or some of these factors may influence the decision about how much information is enough. Foster (2004), like Marchionini, remarks that both external and internal contexts serve to frame information needs, thereby framing the conditions under which those needs become satisfied. He discovers that users' knowledge that they had "enough" information emerged as an iterative

process of questioning whether they had acquired sufficient material to meet the present information need.

Wilson (2005) generalizes a theoretical model of a continuing information-seeking cycle which recognizes the episodic nature of information seeking. Although this model focuses on the information-seeking process, it does not explicitly explore the conclusion stage; therefore, the factors that individuals employ in deciding when to stop information seeking are not identified.

Kuhlthau (2005) depicts the information-search process as a sequential set of intellectual stages: becoming aware of the lack of knowledge or understanding (initiation), identifying a problem area or topic (selection), exploring the problem (exploration), defining the problem (formulation), collecting relevant information (collection), and explaining what the person learned (presentation). This model does not address the effort required to transition through the various information-seeking stages.

Ellis (1989) proposes a behavioral model based on the analysis of a detailed description of information-seeking activities by social scientists. In this model, the decision of whether the information found is sufficient to meet a user's needs is dependent upon chasing and evaluating references as well as systemically identifying content that is of interest to the user. Ellis characterizes six different types of information activities: starting, chaining, browsing, differentiating, monitoring and extracting. He emphasizes the information-seeking activities, rather than the nature of the problems or criteria used for determining when to stop the information search process. In a subsequent article, Ellis (1997) observes that even in the final stages of writing, individuals may continue the search for information in an attempt to answer unresolved questions or to look for new literature.

In Dervin *et al.*'s (2003) sense-making approach, ending an information-seeking episode involves the act of making sense of the situation or resolving the problem with information gathered for that purpose. After finding that information, the information seeker will most likely end the search episode, determining that enough information has been found. Dervin uses the term "outcome" to denote the information-seeking objective. Accomplishing that objective implies the conclusion of the information-seeking episode. Since this model emphasizes the importance of the situation in seeking information and recognizes the episodic nature of information seeking, it does not explicitly address the factors associated with stopping behavior, although sense-making recognizes that given the incomplete nature of reality, the information-seeking process is only ever partially fulfilled. In that sense, satisficing is a key element in Dervin's sense-making approach.

Findings of research on satisficing of academic information needs

In an attempt to identify how and why academic users satisfice their information needs, a major research project utilized online surveys and telephone, focus group and semi-structured interviews (IMLS, 2003). In Phase III of the study, a random sample of seventy-eight academic users participated in focus group interviews to identify how and why they get information. A total of eight focus group interviews were conducted in spring 2005. The median number of participants per focus group was ten and focus group participants included 31 faculty, 19 graduate students, and 28 undergraduate students. The students and faculty were interviewed in separate groups because the

students may have felt uncomfortable freely expressing their opinions in the presence of faculty.

The participants were asked to recollect academic tasks that led them to perform thorough searches. Participants then were asked what made them decide that the information they had was enough while engaged in doing thorough searches. In other words, what criteria did the participants employ to stop looking for information, i.e. to satisfice? Another question asked participants to think of a time when they were in a situation where they needed answers or solutions and they did a quick search for the information, without a thorough evaluation of its credibility, even though they knew there were other sources available and decided not to use them.

Responses to ending thorough searches

Some of the criteria that the participants mentioned may be viewed as quantitative, as exemplified by the student who stopped searching for information once he had acquired the required number of journal sources for an assignment. Other criteria mentioned by participants are qualitative, as exemplified by the remark that when the same information is repeated in several sources, the search is terminated.

The criteria students and faculty use for stopping the information search are shown in the lists below. The academic tasks or situations that prompted the information search are also shown in order to provide a context for the criteria students and faculty mentioned.

Undergraduate and graduate students

Undergraduate and graduate students discussed writing research reports or preparing presentations as examples of academic tasks. Responses of undergraduate and graduate students were combined (see below)

Situations creating the need to look for information (meeting assignment requirements):

- writing research reports; and
- preparing presentations.

Criteria used for stopping the information search (fulfilling assignment requirements):

(1) *Quantitative criteria:*
    - required number of citations was gathered
    - required number of pages was reached;
    - all the research questions were answered; and
    - time available for preparing.

(2) *Qualitative criteria:*
    - accuracy of information;
    - same information repeated in several sources;
    - sufficient information was gathered; and
    - concept understood.

Quantitative criteria
Some students concluded their search as soon they had collected the required number of sources. One graduate student said, "We had to research a certain topic, and we had to have ten sources, and they all had to be journal sources or peer-reviewed sources." Another student said that as soon as he collected enough information to write the number of pages for the report, he stopped the search. This student said, "I don't feel the need to expound on the subject beyond the number of required pages." Another student said that when he found all the information he was trying to research and all the questions had been answered, he stopped looking for information. For many students, the amount of time available for doing the assignment and the relative reward (the value being in terms of the final grade in the course) influenced when they stopped looking for more information.

Qualitative criteria
A graduate student who was looking for the temperature that the Chinese used for making ceramics 500 years ago kept looking for that information until she found the answer in a book. She was then convinced of the accuracy of the information and purchased the title. Some students said that they knew that "it was time to stop looking for information" when a great deal of the information was repeated in several sources. "After I've read everything in the article for like the third time through, I'll just quit. I am like, I have enough," remarked one undergraduate student. Some students stop looking for information once they judge that they have sufficient information to write the assigned report, or when they understand the concept well enough to articulate their thoughts in a report.

Faculty
Faculty referred to both teaching and scholarly or research needs as prompting them to perform thorough searches. As shown below, faculty mentioned preparing lectures to deliver to students, preparing and delivering presentations for classes, and designing and conducting workshops as situations creating the need to look for information.

Situations creating the need to look for information (meeting teaching needs):

- preparing lectures and presentations;
- delivering lectures and presentations;
- designing and conducting workshops;
- meeting scholarly and research needs; and
- writing journal articles, books and grant proposals.

Criteria used for stopping the information search (fulfilling teaching needs):

(1) *Quantitative criteria:*
    - time available for: preparing lectures and presentations; delivering lectures and presentations; and designing and conducting workshops; and
    - fulfilling scholarly and research needs.

(2) *Qualitative criteria:*
    - every possible synonym and every combination were searched;
    - representative sample of research was identified;

- current or cutting-edge research was found;
- same information was repeated;
- exhaustive collection of information sources was discovered;
- colleagues' feedback was addressed;
- journal reviewers' comments were addressed; and
- publisher's requirements were met.

Quantitative criteria

Deadlines dictated how much time faculty invested in finding information sources. One criterion –- amount of time available - was mentioned frequently by many faculty members as affecting their decision to stop looking for information. "Usually if there is a deadline and then I turn it in . . . " said one faculty member. Another faculty member who had recently written a grant proposal said that if an article he wanted was not easily available, he did not include it in the bibliography.

Faculty distinguished between the time available for delivering a lecture or a presentation and the time available for preparing it. Limited by time constraints, one faculty member stopped searching once he had enough information to produce a presentation for class lectures. Faculty were likely to spend more time looking for information to prepare for a two-hour seminar as opposed to a 50-minute classroom lecture.

Qualitative criteria

Some faculty stopped their searches when the topic had been searched "using every possible synonym and in every combination". Others stated that as long as "they represent research legitimately, sampling was okay". However, the representative sample must include information that is current, cutting edge, or unique to the topic. Other faculty said that when they saw the same information repeated in several sources, they stopped looking further. Occasionally, they found an exhaustive collection of material on their topic in one location. For example, a music faculty member who was looking for information to write a biography found about fifty boxes of valuable material at the Library of Congress. Since the material covered the entire life of the individual of interest, the faculty member decided at that point that he could stop looking for information.

A few participants sought comments on their manuscripts, including bibliographies from their colleagues who are also experts in that field. Once the comments from colleagues were addressed, they submitted the manuscripts to the journal publishers. A few faculty members said they consider the search completed once they address journal reviewers' suggestions or publishers' requirements. Faculty seem to apply qualitative criteria for stopping their search for information when fulfilling scholarly or research tasks such as writing journal articles, books or grant proposals.

In summary, the conditions that lead students and faculty to stop looking for more information are both qualitative and quantitative in nature:

(1) *Quantitative criteria for stopping:*

- requirements are met;
- time constraints are limited; and
- coverage of material for publication is verified by colleagues or reviewers.

(2) *Qualitative criteria for stopping:*
- trustworthy information was located;
- a representative sample of sources was gathered;
- current information was located;
- cutting edge material was located;
- exhaustive search was performed; and
- exhaustive collection of information sources was discovered.

Responses to quick searches
An overwhelming number of participants went to the Internet for quick answers. Of these, a good number preferred Google to search the internet. They gave a number of specific reasons for choosing the Internet. Participants valued the internet for finding information quickly and conveniently. They valued the opportunity the internet affords for familiarizing themselves with topics about which they know little. Human sources of information (such as parents or friends) are a common information source for undergraduate students. The objectives of the situations or problems that led them to find information quickly rarely called for a formal or systematic approach to searching.

Role and rational choice theories in human information behavior

As noted, the objective of the research was to discover how users decide when to stop looking for more information. Role and rational choice theories and the concept of satisficing, a derivative of the rational choice theory, were introduced to help place information-seeking behavior in a larger social context. Student responses are separated from faculty responses.

Undergraduate and graduate students
Undergraduate and graduate students tend to view any assignment that the instructor described as a "research report" as requiring a thorough search for information. Whenever the research report had specific requirements such as the number of citations to journal literature, a required number of pages, or the time allotted for class presentations, fulfilling specific requirements took precedence over doing a "thorough" search. Some students were indeed aware that they could search endlessly and explore the topic in great depth but chose not to do so; instead they satisficed their information needs by remaining within the boundaries of what was required for the assignment.

For students, the relative reward (the value being in terms of a final grade) was a key factor in deciding the amount of time to invest in assignments and clearly suggests the operation of rational choice theory. The quantitative and qualitative criteria students employ indicate that they are acting rationally in choosing to stop looking for more information.

Faculty
Faculty responses can be placed in two groups, qualitative and quantitative, based upon the information-seeking task chosen. The amount of time they spent searching for information tended to depend on the amount of time they had at their disposal when it came to giving lectures, making presentations, or conducting workshops. However, faculty occasionally mentioned that the time available was a factor in stopping to look

for information when they were pursuing their research and scholarly endeavors such as writing journal articles or books.

Faculty are acting rationally in juggling the amount of time they allocate to prepare for class lectures or presentations. When pursuing scholarly endeavors, such as publishing an article, they are acting rationally in not concluding their information search until they receive feedback from colleagues or reviewers. The larger objective is to publish the article, and thus they will invest whatever effort is needed to accomplish that goal.

These faculty members employ several criteria to decide how much information is enough for their purpose. Some of the criteria are qualitative, or intrinsic, judgments, such as the credibility of the source of information; other criteria are quantitative, or extrinsic, assessments such as time constraints. Based upon their responses in the focus group interviews, faculty indicate that they make rational decisions in determining when to stop their search for more information.

Discussion and conclusions

Studies of information seeking and searching make oblique inferences to satisficing in the context of disengaging from the information-seeking process. Previous studies mention several factors utilized by individuals when determining when to stop looking for information. These factors include the:

- users' objectives or motivations for wanting the information;
- characteristics of the information need;
- external variables such as setting, context, and situation;
- internal variables such as motivation and searching skills; and
- phase of the project (ending phase).

Role theory, rational choice theory, and satisficing are introduced to determine how these concepts can contribute to a deeper understanding of human information behavior. The Institute of Museum and Library Studies (IMLS) study "Sense-making the information confluence" (IMLS, 2003), which asked students and faculty explicitly how they decide how much information is enough, reveals that the participants' approaches to information sources and strategies, and the amount of time and effort they devote to searching, correspond directly to the perceived importance of their objectives. Although these findings support previous research and theories, they are not generalizable because of the small sample size. However, these results are important since the study directly asks users to explain their information-searching behaviors in the current information environment and their responses substantiate information behavior theories and findings from previous studies.

Undergraduate and graduate students tend to stop looking for information when they find the required number of sources for an assignment. This behavior supports the theory of Kraft and Lee (1979) that individuals find the desired number of documents and then stop. This also supports Barrett's (2005) findings that undergraduate students seek to find enough information to fulfill course requirements.

Faculty as well as undergraduate and graduate students indicate that time constraints influence when they stop looking for information. This finding corroborates the results of the study of historians' information-seeking behavior by

Duff and Johnson (2002) and Dalton and Charnigo (2004). They report that historians stop their information-gathering process because of time and financial constraints. Dalton and Charnigo (2004) also state that some historians develop research topics based on the proximity of primary sources, a factor influenced by the limitations of time and money.

Zach's (2005) study indicates that art administrators stop looking for information when they feel comfortable that they can complete the task, even if they think that additional information may be available. The comments by all participants in the focus group interviews support this type of satisficing information-seeking behavior.

All the participants in the focus group interviews said that the first place they look for information is the internet, closely followed by human sources. The rationale for this behavior is the immediacy and convenience of acquiring the information. Leckie *et al.* (1996, p. 185) report that engineers and lawyers say it is very important to obtain information immediately or "its usefulness. . .will decrease if it is obtained either too early or too late". With the ubiquitous accessibility of internet search engines, cell phones, and text and instant messaging, immediate access to information is the expected norm.

Role theory helps to explain why students and faculty practice different search behaviors. The students' criteria for stopping an information search are influenced by the requirements of their class assignments. Faculty's criteria for stopping an information search are based on publication requirements and deadlines and the amount of time available for preparing and delivering lectures and presenting papers. Time constraints are an overwhelming factor for faculty in deciding how much effort they are willing to invest in satisficing their information needs.

In describing their information seeking and searching, participants mentioned their rationale for choosing specific strategies and sources. The situational contexts of the participants' information-seeking experiences affect every stage of their search – from the choice of their first source (Google in many cases, or human resources such as family, friends, and colleagues) - to ongoing strategies (depth of search, value judgments on resource authority, browsing and searching) and then decisions on how much information is enough.

Implications for library and information science practice and research

In order for libraries to stay relevant, their systems need to emulate internet search engines. Such features as simplified searching and the collocation of all types of information (e.g. books, journals, articles, web pages, etc.) facilitate users' search experience which obviates the need to understand the complexity of library systems. Both OCLC (De Rosa *et al.*, 2005) and Williams (2006) indicate that users want their library systems to be as easy to use as Google.

The findings of the focus group interviews also indicate that libraries need to promote the library resources that are available to users. Both the OCLC report (De Rosa *et al.*, 2005) and many of the focus group interview participants (IMLS, 2003) state that they were unaware of the full-text sources available through library-hosted databases. Those who are aware of them tend to find them difficult to use because of the need to know specific subject coverage of databases, a knowledge that is often difficult to comprehend when doing interdisciplinary research. In addition,

participants indicate that the inconsistent search protocols of library web sites and online catalogs discourage effective use.

A vast amount of human computer interaction (HCI) research attempts to understand the search process. HCI addresses how users conceptualize searching and how the design of systems impacts users' satisficing their information needs.

The findings from Phase III of the research project (IMLS, 2003) broaden the scope of earlier user research, which tends to focus more on the process of information seeking and searching. This research often portrays users' information-seeking behaviors as static and habitual. Satisficing, an idea introduced as early as 1955 (Simon, 1955), helps to explain how individuals make information choices. Schmidtz (2004, p. 30) views satisficing as a "humanly rational strategy".

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