
**INFORMATION SEEKING HEURISTICS OF UNDERGRADUATE LIBRARY
AND INFORMATION SCIENCE STUDENTS OF THE
UNIVERSITY OF THE PHILIPPINES DILIMAN**

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Abstract

A “heuristic” is the rule of thumb processes, procedures, mental short-cuts and strategies people employ believing it is the best way to solve a problem. This article maps Marchionini's model of information seeking to Sternberg's problem-solving model in order to present three data collection methods which were tested in a psychological research methods course for the study of information seeking among undergraduate library users.

The data collection methods tested were observation, interview and questionnaire. Testing was done at the School of Library and Information Studies, University of the Philippines Diliman. The observation was conducted in the SLIS library while the interview and questionnaire were tested with SLIS undergraduate students as participants. Two undergraduate students enrolled in a research methodology course were randomly chosen for the interview while a purposive sample of 46 students belonging to various year levels pre-tested the questionnaire. Results show that all methods can record actions related to information seeking but it is the interview that captures the most wholistic picture of an individual's information seeking.

Information seeking as a problem-solving process is the main concern of this study, which aimed to test three data collection methods to find out how students in an undergraduate program in library and information manifest information seeking as problem solving in their actions that lead them to the sources of information and how they make use of these sources. It also sought to study relationships between identified factors that affect information seeking and the students' information seeking process.

Information Seeking as Problem Solving

Problem solving is “an effort to overcome obstacles obstructing the path to a solution” (Sternberg, 2006, p. 535). A heuristic is the “rule of thumb” processes, procedures, mental short cuts or strategies people employ because they believe it is the best way to solve a problem (Matlin, 1994; Benjafield, 1993; Sternberg, 2006). Though the use of heuristics may largely explain human information seeking behavior, the concept has seldom been referred to in the literature of library and information science. The process of information seeking, though, has been acknowledged as a problem-solving activity (Bystrom & Jarvelin, 1995; Kuhlthau, 2004; Marchionini, 1995). Several models of human information seeking behavior and the information search actually parallel Sternberg’s problem-solving cycle (2006). According to Sternberg, problem solving may be described as a cycle composed of seven steps: problem identification, problem definition and representation, strategy formulation, organization of information, resource allocation, monitoring, and evaluating. Kuhlthau’s (2004) model of the information search process (ISP) contains six steps – task initiation, topic selection, prefocus exploration, focus formulation, information collection, and search closure, and incorporates three realms – affective (feelings), cognitive (thoughts) and physical (actions). For Marchionini (1995), information seeking involves recognizing and accepting an information problem, defining and understanding a problem, choosing a search system, formulating a query, executing a search, examining results, extracting information and reflecting/iterating/stopping the information seeking process.

According to Marchionini, information seeking is “a process in which humans purposely engage in order to change their state of knowledge” (p. 5). Factors that affect information seeking include: the gaps in the information seeker's knowledge that cause them to seek information outside their memory (Bystrom & Jarvelin, 1995; Drabenstott, 2003; Kuhlthau, 2004; Marchionini, 1995), task complexity (Bystrom & Jarvelin, 1995), the availability of search systems such as people, books, and electronic resources and how the information seeker interacts with them in terms of *search strategies* (Dalrymple, 2001; Katz, 1997; Marchionini, 1995), the information seeker's domain or specialization (Drabenstott, 2003; Marchionini, 1995), the context of the information seeking or setting (Kuhlthau, 2004; Marchionini, 1995; Sternberg, 2006) and expected search outcomes (Marchionini, 1995). Just like in the problem-solving cycle, problem identification, definition and representation is considered an important step in the information seeking process (Bystrom & Jarvelin, 1995). But unlike the problem solving cycle where information collection comes later, using information from both informal and formal sources is employed throughout Kuhlthau’s ISP model.

Marchionini’s model of information seeking brings down Sternberg’s problem solving cycle to a more specific level wherein certain steps in information seeking correspond to steps in problem solving. But while specific steps have been enumerated by Marchionini and Sternberg, provisions are in place wherein the problem solver or information seeker may jump from one step to another depending on how efficiently tasks in one step have been accomplished. Likewise, it is possible that several steps in Marchionini’s model would correspond to one or more than one step in the problem solving cycle (Table 1).

Table 1. Steps in Sternberg's Problem Solving Cycle vis-à-vis Marchionini's Information Seeking Model

| STERNBERG'S Problem Solving Cycle | MARCHIONINI's Information Seeking Model |
|--|--|
| ◆ Problem identification | ◆ Recognize and accept an information problem |
| ◆ Problem definition and representation | ◆ Define and understand the problem |
| ◆ Strategy formulation | ◆ Select source/Choose a search system ◆ Formulate a query |
| ◆ Strategy formulation/Organization of information | ◆ Formulate a query ◆ Execute search |
| ◆ Organization of information | ◆ Examine results ◆ Extract information |
| ◆ Resource allocation | ◆ Select source/Choose a search system ◆ Extract information |
| ◆ Monitoring | ◆ Examining results ◆ Extract information ◆ Reflect/iterate/stop |
| ◆ Evaluation | ◆ Examining results ◆ Extract information ◆ Reflect/iterate/stop |

Problem Identification

In Marchionini's model of information seeking, problem identification comes in the form of recognizing and accepting an information problem. The motivation to recognize this need may be either internally or externally motivated. But though research in school is usually externally motivated, internal motivation may come in when students are made to choose their own topics. Awareness comes when one recognizes ambiguity, uncertainty or deficiency in one's knowledge, and actions taken by an individual may either be suppression or acceptance of the problem (Marchionini, 1995). This decision is affected by the information seeker's setting and judgment of how worthwhile solving the problem will be. Knowledge about task complexity and domain, setting, knowledge of search systems and the information seeker's personal information infrastructure (access to people, primary and secondary sources) likewise

will influence the decision to solve a recognized problem. Once recognized, a problem can now be defined.

Problem Definition and Representation

According to Marchionini (1995), the process of defining and understanding the problem “remains active as long as the information seeking progresses” (p. 51). Like problem recognition, problem definition is dependent on knowledge of the task domain and may be influenced by setting. It entails identifying key concepts and relationships between concepts while actions involved include limiting, labeling, forming or framing for the answer. In limiting, the information seeker identifies related knowledge or similar problems, and excludes unrelated knowledge. Then, concepts, words, phrases, events or people related to the problem are also listed, grouped and categorized. At this point, problem statements and hypothesis/es may be formulated while expectations of the final product must be known. The way the problem is defined determines the general strategy. If the topic is general in nature, a search in the library catalog for a few books might be enough to solve the information problem. If the topic requires newer material on a topic that has only been recently studied, information seeking might require searching various databases, Internet sources or further consultation with colleagues.

Strategy Formulation

In the context of information seeking, several steps in Marchionini’s model comprise the single step of strategy formulation – selecting a source or choosing a search system, formulating a query and executing a search. According to Marchionini, selecting a source and choosing a search system is dependent on the information seeker’s task domain, personal information infrastructure and problem definition. An individual’s domain knowledge may be described as either expert or novice. Experts can pinpoint information systems and use specialized sources applicable to specific problems. Novices use search systems for a broad range of problems or situations. A major activity in choosing a search system is mapping tasks to search systems. Which source or search system would provide the right kind of information to help solve the problem? This activity, therefore, depends on how the information seeker perceives the complexity of the task (simple or complex) and the presence of available and familiar search systems, including colleagues, intermediaries (ex: reference librarians), primary sources, secondary sources, electronic and online systems that are general and specific. According to Sternberg (2006), strategy formulation involves analysis (breaking down of information into parts) and synthesis (putting together elements of information to come up with something useful). It also requires both divergent and convergent thinking (the ability to see diverse alternatives and narrow down possibilities). When the information seeker has to do filtering, ordering and selecting from a collection of sources, specific titles of materials, persons or databases have to be identified and consulted using language that is applicable to the search system. Different information is presented in a variety of ways by the different search systems to satisfy information needs for varying degrees of expertise. Various types of information seekers would be faced with several choices, and they need to choose which would be proper for them considering their knowledge of their own personal information infrastructure.

In query formulation, the information seeker must be aware in choosing terms of broad or narrow application to use in searching for sources when using search systems, especially print and electronic ones. This involves what Marchionini calls semantic mapping, wherein one has to reconcile personal vocabulary with the vocabulary of the search system – the terms used by the book, the individual, or the indexing system of the database. From the end of information analysts, the needs of groups of users (students, professionals, scientists) are considered when developing thesauri and subject headings lists used to index books, periodicals and other materials. Aside from semantic mapping, information seekers likewise use action mapping to match the structure of their vocabulary with the syntax allowed by a search system. Unlike in a conversation with a fellow human being wherein vague meanings and ambiguous terms can be clarified right away, searching the Internet or an electronic database requires one to be familiar with search strategies and the search syntax allowed by the system's search interface. For instance, an individual looking for books and journals through the library OPAC and commercial databases must be aware that searching can be through author, title and subject or descriptor, and the format of a catalog or index entry includes location or other symbols aside from bibliographic data. The individual must also be familiar with the search interface, and how terms can be combined to expand or narrow down search results through the use of Boolean operators (ex: AND, OR, and NOT) and truncation devices (ex: computer?), and the presence of different levels of searching (ex: "Basic" and "Advanced") for browsing or known-item searching.

Executing a search may entail doing such actions as asking a question, browsing the library collection, scanning a book, typing search terms in the search box of the online database's or search engine's search interface. In the process, the information is delivered to the information seeker who then judges the relevance of such information which could lead to any of the following actions: further examination of results, revision of the search strategy or search terms, or choosing a different search system altogether.

Organization of Information

According to Sternberg it is in the step of organizing information where one integrates the information gathered to come up with a solution. With the advent of abstracting services, full-text databases and the Internet, the process of executing a search actually covers both steps of strategy formulation and organization of information. Since the information seeker is allowed to preview the content or access the text of the documents themselves, they are already in the process of examining results. Therefore, the steps in Marchionini's information seeking model that apply to organization of information include executing a search, examining results, and extracting information.

The main task the information seeker does when examining results, according to Marchionini, is judging the relevance of the information retrieved depending on the details provided by the search system (ex: bibliographic data, full text, references or links, illustrations) and the quantity of information. The judgment of the information's relevance will affect the information seeker's decision on what to do about that piece of information next, which include the actions such as stopping or reformulating the search, examining or rejecting the document or examining it at a later time or redefining the problem altogether (Marchionini, 1995).

The method by which the information seeker extracts information depends on the services accommodated by the search system. If the information were available in a library accessible to the individual, applicable actions would depend on the type of material retrieved, if it is a book or journal, in print or electronic format. Available options would include borrowing the material itself, photocopying, printing, saving or downloading citations or documents to a storage device or sending citations or documents to an online storage account for later retrieval. Furthermore, when the information seeker retrieves enough information, this information is then analyzed, classified, and synthesized to solve the problem.

Resource Allocation

According to Sternberg (2006), resource allocation pertains to being aware of, and dealing with limited resources such as time, money, equipment and space. Roughly, for Marchionini, the allocation of limited resources is explained in the concept of setting, the awareness of which affects the selection of a source and choice of a search system and in extracting information. Therefore, awareness of the setting is to be considered in choosing the library, section or collection of the library to browse, which specialist to consult, which database to search and whether to print, download or send the information retrieved from the database.

Monitoring

Though monitoring is done throughout the process of information seeking, it is most evident when one is already in the process of retrieving documents, judging their relevance and deciding which to use for a particular purpose. When, for instance, upon judging that most of the documents displayed on the screen are irrelevant to the search, the information seeker decides whether to reframe the query, choose another search system, or redefine the problem.

Evaluation

Information seeking essentially ends when enough information has been gathered to solve an information problem. But, other factors such as deadlines, limitations of the search system and setting might also cause the information seeking to stop. In case the information seeker still has the time and resources and not enough information has been gathered she or he can go back and review the information problem, select other terms to search, search the same terms in another search system or examine other information retrieved earlier but have not yet been examined or extracted.

Testing the Methods

Studies on information seeking in the Philippines mostly focus on the preferred search systems and information sources by groups of people belonging to particular domains such as students (Sison, 2003; Ortega, 2005; Santos, 2008) and medical doctors (Tesoro, 2003; Tinay, 2003) in carrying out their information-related tasks in the context of their use in an Internet/electronic database search or library setting. Questionnaire is the most common data collection tool and questions usually asked are related to respondents' most used information resources, databases, and search strategies, and the issues and perceptions the respondents have

regarding the search systems, information resources and search strategies available to them.

Observation

Systematic observation was conducted at University of the Philippines Diliman School of Library and Information Studies (UP SLIS) library. Participants were the undergraduate students enrolled in UP SLIS. Undergraduate enrollment of the academic unit during the time of the study was 241, with an almost equal number of males (45%) and females (55%). Most of the students were in their 4th year (around 73%) and came from the National Capital Region (64%). The observer was a full time faculty member of the academic unit. Permission was obtained from the dean and head librarian to conduct the observation, interviews and distribute questionnaires.

A preliminary observation was done at the library for seven hours and 15 minutes in a span of four days with each observation session lasting from one to two hours and 30 minutes. A total of 11 undergraduate students (4 – male, 7 – female) were observed. The movements and actions were recorded on an observation sheet, which was based on the layout of the library. The movements of the participant were plotted on the sheet using marks to designate whether the student browsed an area/shelf and checked a book, journal or other material, browsed the area/shelf but did not refer to the materials found there, interacted with the librarian or library staff, or interacted with someone other than the librarian or library staff, or did something unrelated to information seeking. The time in which the student spent in each action was recorded using the stopwatch function of a mobile phone. Those observed stayed within the library from over three minutes to over two hours.

The actions were supposed to be classified according to Kuhlthau's model of the Information Search Process (ISP). Unfortunately, results did not lend themselves to classification, as actions observed were not indicative of information seeking behavior relating to an information problem. The type of action observed most often were “movement” with 80 occurrences and done by all those observed, followed by “inquired with a fellow student” with 23 occurrences and done by 10 of those observed. Five or less of those observed did other activities such as “checked OPAC or database” (5), “browsed and checked a book” (4), “browsed and checked other materials” (3), and “inquired with the librarian/library staff” (3). The observation tool may be improved by devising it in such a way as to enable the observer to observe students doing activities more specific to information seeking and allow the observer to check how subjects use available search systems such as the OPAC, online databases and internet sources.

Interview

A standardized interview was pre-tested among students enrolled in the research methodology classes required in the school's program. Three students were randomly selected using the list of students enrolled in the section not handled by the researcher/interviewer. If the chosen student is not available, another student was selected until the desired number of students had been interviewed. During the period allotted for interview, only two students, both female, were interviewed.

Before the interview began, informed consent was obtained from the students. It was

made clear to them that: a) the interview is not a test of their information searching skills, b) it will not affect their grades in their research methodology classes, and c) that the interview will be recorded.

The original interview guide consisted of 32 questions in six parts corresponding to Sternberg's Problem Solving Cycle (2006) with some questions based on Kuhlthau's model of the Information Search Process (ISP), specifically the statements describing the library users' thoughts, feelings and actions as they go through the ISP. Both interviews were recorded and transcribed word-for-word.

An examination of the pre-test interview transcripts shows that it is possible to probe the specific actions, thoughts, and feelings of respondents based on both Marchionini's and Kuhlthau's models. Terms can be identified and/or translated and categorized in terms of the three realms encompassed in Kuhlthau's ISP model such as actions: *nabasa* (read), *nakita sa* (seen in a) website, *naghanap* (searched); thoughts: *nag-decide* (decided), *tinandaan* (remembered), *nag-focus* (focused); and feelings: *tinamad* (lost momentum), overwhelmed. The following example likewise illustrates the effect of the respondent's domain knowledge on their choice of topics:

Interviewee 1: "...*meron kami sa org 'yung parang marketing concepts...*" ("... we had marketing concepts in our [student] organization)

Interviewee 2: "...*kasi po nag e-SA po ako sa library...*" ("...because I was an SA [Student Assistant] in the library...")

Unfortunately, no data analysis tool was constructed prior to conducting the interviews to systematically categorize and translate the responses. It was therefore difficult to conduct objective analysis on the responses especially that most were in Filipino. Responses may have been plotted in a flowchart to illustrate the interviewees' information seeking processes. A table to list the actions, thoughts and feelings for each step of the process may also be used for categorization. Another weakness of the pre-tested interview guide was that the questions were too broad that some responses encompass several information seeking steps. Therefore, to facilitate categorization and analysis, questions have to be more specific and point to actual actions, thoughts and feelings while at the same time allow for probing when the situation arises.

Questionnaire

A questionnaire was pre-tested to gather data that sought to identify the actions taken by respondents when doing research that corresponds to stages in Sternberg's problem solving cycle. The questions mainly sought to find out the sources the respondents consult and the tasks they do pertaining to information seeking, gathering and use.

Quota sampling was employed in distributing the questionnaires using a quota frame based on student enrollment for the second semester of academic year 2007-08. The actual sample of students who participated in the pre-testing was 46, 21 (45.65%) of which were male and 25 (54.35%) of which were female. When categorized according to year level, there were

three in 1st year, 10 in 2nd year, nine in 3rd year, 12 in 4th year, 11 in their 5th year and above and one who indicated “Cannot say” in the questionnaire.

There were only one to two questions per stage of the information seeking process but each provided as many choices as identifiable plus one open ended choice. The problem identification question focused on the people and sources of information the respondents consult in selecting a topic for research. The sources consulted by at least a third of the respondents were their teachers (91.30%), classmates (86.96%), reading list in the subject, and Internet search engines (both 76.09%). Problem definition likewise focused on the people and sources of information the respondents' consult when choosing a focus or narrowing down a research topic. Results show that the sources consulted by at least half of the respondents include teachers (89.13%), theses (56.52%), classmates, and reserve books (both 47.83%). Strategy formulation focused on the respondents' approaches to searching information and the actions chosen by at least half of the respondents include looking up sources cited in bibliographies or reference lists in books (71.74%), asking the teacher (69.57%), looking up sources cited in bibliographies or reference lists in journal articles (60.87%), looking up sources cited in reference lists of theses (56.52%), combining terms using Boolean operators (54.35%), asking classmates for relevant sources (52.17%), and using a thesaurus or subject headings list to choose relevant search terms (50%). The organization of information questions only focused on what the respondents do when gathering information and how they take down information about their sources. An almost equal number of respondents first come up with a preliminary list of sources (65.22%) and select the most relevant sources first before borrowing, downloading or photocopying (63.30%). More than half (58.70%) use the citation format specified by the teacher while a little less than half (47.83%) either use the citation format specified or just take down the information available about the source depending on the situation. Regarding resource allocation and monitoring, half of the respondents start writing the paper only when they feel they have gathered enough information (50%) and more than half feel that they spend the most time in synthesizing the paper (63.04%). Less than half feel they spend more time in searching (41.30%) and gathering (45.65%) information.

The weakness of the questionnaire in studying information seeking is obvious. The lack of flexibility in the questions limits how the researcher can extract the possible range of actions, thoughts and feelings that the subject experiences during the information seeking situation. It should be noted though, that patterns can still be observed from the data. As evidenced by the data previously mentioned, both teachers and classmates are consulted by majority of respondents from problem identification to strategy formulation, showing the value of formal and informal mediators in the information seeking process (Kuhlthau, 2004).

Comparison of Methods

Systematic observation mainly records actions, but can only be anchored on an information problem, search system or setting if specially designed for a specific purpose such as when evaluating a new database/online/Internet service or in designing instructional materials or tutorials for the use of such.

Among the three methods, interview captures the most wholistic picture of an individual's information seeking in a particular context. When tested in this case, the information seeking of students enrolled in a research methods course was documented from the time the respondents were exploring topics, narrowing them down, choosing from various

search systems and sources, up to the point when they felt a certain degree of comfort with the way they conceptualized their topics. Aside from actions, decision-making and other cognitive as well as affective processes were articulated by the respondents. Though it is time consuming to transcribe a recorded interview, having the text to the interview for reference plus a means of translating and categorizing the data will greatly facilitate data analysis.

Similar to some qualities of systematic observation, the questionnaire mostly records actions, preferences for search systems, information resources and search strategies, but cannot show how respondents make decisions and the reasons for their preferences. Contextualizing the questionnaire though, may be done by grouping the respondents according to criteria, or surveying a purposive sample (ex: freshmen students, graduate students, non-English speaking population), depending on the objective of the survey or study.

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