

Interdisciplinary Work and the Information Search Process: A Comparison of Manual and Online Searching

Laura M. Bartolo and Timothy D. Smith

Library users' research interests and needs are becoming increasingly interdisciplinary. This type of research presents searchers with obstacles that differ from disciplinary research. Using the information search process (ISP) developed by Carol C. Kuhlthau as a theoretical model, this study compares the impact of manual and online search methods on the interdisciplinary search task in terms of the relevance of retrieved items, user effort, user satisfaction, user confidence and future use. This comparative investigation examines two senior-level journalism classes researching judicial decisions related to the mass media. One class used printed legal reference sources; the other class used LEXIS, a full-text legal database. The results of this study indicate that online search methods are more effective than manual search methods when users are working outside their areas of specialization.



Some of the most provocative topics of debate within the academy today concern the notions of disciplinary boundary lines and interdisciplinarity.¹ These discussions are not totally new, nor are the challenges facing researchers embarking on these new or blurred frontiers. In 1972 M. E. Freeman noted, "For half a century scientific progress has developed toward interdisciplinary and broad scope technologies. At the same time the information resources necessary for orderly scientific development

have become increasingly fragmented and specialized. The multidisciplinary or interdisciplinary scientist has found it more and more difficult to locate precisely the information he needs."² Freeman's comments highlight two important and conflicting factors in interdisciplinary work: the broad research interests of scholars and the development of highly specialized information resources. Today academic librarians frequently encounter these features when they help library users investigate such broad topics as international politi-

Laura M. Bartolo is Reference Librarian, and Timothy D. Smith is Professor and Acting Director of Journalism and Mass Communication at Kent State University, Kent, Ohio 44242-0001. Research for this article was jointly sponsored by the Council on Library Resources (Grant No. 860) and the Office of Research and Sponsored Programs at Kent State University. The authors thank Stanley Fish, Chairman of the department of English and Professor of Law at Duke University, for permission to cite his talk delivered at the Folger Institute on November 30, 1990; Roy S. Lilly, Professor of Psychology at Kent State University, for his assistance in the design and statistical analysis of this study; and the referee for College & Research Libraries for helpful suggestions reflected in the conclusion of this article.

cal economy as well as search such specialized resources as *Thesaurus Linguae Graecae (TLG)*.

Though there have been many articles in library journals addressing interdisciplinary topics, most have focused on selecting materials for these areas.³ Other articles have addressed such issues as subject overlap in online databases, the impact of new trends in higher education, citation analysis, and bibliographic instruction for interdisciplinary courses.⁴⁻⁷ However there has been no direct study of users researching interdisciplinary projects and the challenges they encounter. While the problems of interdisciplinary work are not entirely new, advances in technologies have altered their impact on researchers.

This paper describes a comparative study of two senior-level journalism classes. One class employed manual search methods to identify and evaluate judicial decisions relating to the mass media; the other class used online search methods for the assignment. Following the information search process (ISP) developed by Kuhlthau as the theoretical model, the authors investigate effective search methods for library users, particularly novice users, when working on interdisciplinary subjects outside their area of specialization.⁸ Specifically, this study addresses how the search method affects the relevance of retrieved items, user effort, user satisfaction, user confidence, and future use. However, before describing this investigation, it is necessary to define *interdisciplinary work* as it is used in this study and to highlight the theoretical principles of ISP as it relates to the challenges of interdisciplinary work.

INTERDISCIPLINARY WORK

As numerous articles have argued and as Julie Klein thoroughly documents in her recent book, *Interdisciplinarity*, interdisciplinary work is not limited to scientific fields but is found across all disciplines of knowledge.⁹ Academic librarians are increasingly seeing the proliferation of interdisciplinary work — when assisting researchers who con-

duct literature reviews across disciplinary lines, in selecting new monographs and journals to support interdisciplinary research, and in preparing BI for interdisciplinary curriculum.

Considerable discussion as well as misunderstanding exists about the precise meaning of the term *interdisciplinary work*. Julie Klein defines interdisciplinaryity as "the ideas of a *unified science*, general knowledge, synthesis, and the integration of knowledge," (the authors').¹⁰ Yet interdisciplinaryity has also been used to convey the awareness of disciplinary differences. Stanley Fish has stated, "It is in the name of difference — of the recognition of perspectives, materials and interests excluded from the disciplinary focus — that one calls for interdisciplinary work, for work that insists on looking into the other fellow's back yard."¹¹

In his discussion about the nature of interdisciplinary work, Fish further notes that researchers "borrow" from other fields in order to meet their immediate research needs and relate that work to their own discipline.

This study adopts Fish's definition of interdisciplinary work and examines the searcher's effectiveness in disciplinary backyard borrowing. In his discussion about the nature of interdisciplinary work, Fish further notes that researchers "borrow" from other fields in order to meet their immediate research needs and relate that work to their own discipline. "One begins with a 'sense of task' derived from some enterprise, some recognizable project, and within that sense one makes use of the materials that come to hand, including materials generated by other enterprises, but materials that will be received (and perceived) in the form appropriate to the job of work you are now doing."¹² Librarians working one-on-one with individual library users or with a class through BI must take into account these disciplinary differences. For example, it is equally important for the librarian instructing journalism students

in legal research methods to relate legal research to the field of journalism as well as it is to outline the principles of legal research.

Interdisciplinary work presents library users with challenges different from those of disciplinary research. When researchers from one discipline borrow materials from another discipline, they must borrow intelligently to ensure the success of their project. First, users embarking outside their territorial lines must be aware of current developments in other disciplines. Second, this awareness of new developments encourages a sensitivity to where different but related disciplines can converge. Finally, in interdisciplinary work the user must identify the appropriate terms and principles to borrow from another discipline. Once the user assesses the perspectives and materials that are needed and from what disciplines they can be borrowed, then the searcher stands on firm ground ready to embark on the enterprise.¹³ To best understand how one addresses the challenges of interdisciplinary research—awareness of new developments, understanding of common ground, and determination of relevant concepts and findings—it is necessary to investigate information seeking behavior from the user's perspective.

INFORMATION SEARCH PROCESS

As Carol C. Kuhlthau defines it, the "information search process (ISP) is the user's constructive activity of finding meaning from information in order to extend his or her state of knowledge on a particular topic or problem. It incorporates a series of encounters with information within a space of time rather than a single reference incident. Uncertainty and anxiety are an integral part of the process, particularly in the beginning stages."¹⁴ ISP primarily analyzes the library user's quest for information. People synthesize new information based upon what they know or have experienced, and they construct meaning from the information they come upon. Kuhlthau identifies six stages in the information search process:

1. The initiation stage when users recognize the need for information and, conversely, their lack of knowledge.
2. The selection stage when users identify and select a general topic or approach.
3. The exploration stage when users orient themselves to the topic in order to form a stand or point of view.
4. The formulation stage when users select a focus or perspective for the topic.
5. The collection stage when users gather information related to the focused topic.
6. The presentation stage when users complete the research and prepare the finalized work.

ISP recognizes the psychological as well as intellectual activity involved in the endeavor of seeking and gathering information. In the first four stages of ISP, confusion increases as inconsistencies and incompatibilities of new information relative to what was previously known are encountered. If searchers experience difficulty locating information about their topic, they begin to doubt the relevance of the newly found information and may abandon their project entirely.

Reference librarians working with individual library users or with an entire class frequently encounter searchers with undefined projects who express frustration and confusion about their work. Relatively minor problems, such as what periodical indexes to use, how to search them, and where to find journal articles, can appear insurmountable to the library user at that stage. Kuhlthau observes that two competing elements foster this sense of anxiety. The individual is engaged in seeking information while at the same time formulating the research project. This dilemma is heightened by the searcher's lack of familiarity with the organization of information.¹⁵ Reference librarians must recognize that until the user begins to identify the needed resources successfully and to focus the project, the entire work can be in jeopardy.

While Kuhlthau contends that all searchers undergo some degree of anxiety, those involved with interdisciplinary projects risk experiencing an even greater sense of frustration and anxiety than those involved with disciplinary work. The duality of the interdisciplinary search task—the need to find information and the lack of knowledge of another discipline—potentially heightens the level of uncertainty and anxiety for the researcher.

Interdisciplinary work, then, presents different challenges for researchers from disciplinary work. Individuals working in another discipline need to be aware of new developments in the other field. In addition, they need to understand the common ground between the two disciplines and to determine relevant concepts and findings to borrow from the other discipline. Given the challenges of interdisciplinary work and in light of ISP, how do manual or online search methods affect the successful completion of interdisciplinary projects?

RESEARCH QUESTIONS

In general, this study examines how the search method used to find relevant information affects the user's search process when working on interdisciplinary projects. It was the authors' hypothesis that searchers working on interdisciplinary projects who conduct online information searches meet the challenges of interdisciplinary work more successfully and develop better researched projects than those who employ manual information search methods. To test this hypothesis, we analyzed the results of student bibliographies of judicial decisions relating to mass media (faculty evaluated) from two senior-level journalism classes and questionnaires completed by the same students at the end of the course. Specifically, our research addressed the following questions:

1. Is there a difference between manual and online search methods in terms of relevant material retrieved for interdisciplinary topics (faculty evaluated)?

2. Are there differences between manual and online search methods for interdisciplinary topics in terms of the following indicators of anxiety: user effort (time required and ease of use), user satisfaction, user confidence (need for help), and future use.

RESEARCH METHOD

The subjects for this two-semester study were students enrolled in spring (manual group, $N=34$) and fall (online group, $N=35$) senior-level journalism classes, "Law of Mass Communication." These classes were chosen because students who generally enroll are journalism majors with little or no background in legal research.

The research assignment for both groups was a two-part project that required students to submit two bibliographies which located and evaluated judicial decisions pertaining to a particular topic on the mass media. The first part of the class assignment (preliminary bibliography) followed Kuhlthau's first four stages of ISP—initiation, selection, exploration, and formulation—where the students selected their topic, gathered information and focused their research project. For the preliminary bibliography, both the manual and online groups were required to find between twenty to twenty-five judicial decisions that the students perceived to be relevant to their research topic. A judicial decision was considered relevant by the faculty member if it was closely related to the legal issues involved in the research topic. This assignment focused on the students' ability to locate court cases on a particular topic using print materials or online databases.

The second part of the class assignment (final bibliography) involved Kuhlthau's last two stages of ISP—collection and presentation—where the students read the material listed on the preliminary bibliography and, based upon their reading, selected the material to be listed on the final annotated bibliography. For the final bibliography both the manual and online groups were required

to select from the preliminary bibliography between four to ten judicial decisions they considered to be landmark cases in that area of law. The students were also asked to write detailed abstracts about each of the court cases they had selected. The purpose of this assignment was to go beyond the students' ability to find court cases. The preliminary bibliography measured the students' understanding of basic legal research. The final bibliography examined the students' understanding of legal principles by assessing the students' evaluation and description of judicial decisions.

INSTRUCTION AND TREATMENT

Instruction and treatment for the two groups—manual and online—were as similar as possible. Both groups had two one-hour legal research sessions and a one-hour tutorial session. On the second week of class the librarian conducted the first one-hour session and discussed the elements of legal research and the specifics about either manual or online research methods. The manual group was trained to conduct manual legal research—that is, to use print legal secondary sources, such as the *American Law Reports* series (ALR), legal digests, law review articles, and legal encyclopedias—in order to compile the bibliographies. The online group was shown how to conduct online searches using *LEXIS*, a full-text online database, in order to complete the bibliographies. During the third and fourth weeks of classes each student had a one-hour tutorial session with the librarian to learn individually how to use either manual or online research methods in relation to his or her specific topic. After the students handed in the preliminary bibliography, the librarian conducted the second one-hour session focusing on how to evaluate and abstract the judicial decisions.¹⁶ After the students handed in the final bibliography, they completed a questionnaire which assessed user effort, user satisfaction, user confidence, and future use in relation to the search method and search product.

The following variables were examined in the study:

- **Retrieval Size:** The number of judicial decisions listed on each of the bibliographies.
- **Precision:** The number of judicial decisions that the faculty member judges to be relevant to the research topic. Precision is reported as a percentage of retrieval size.
- **User Effort:** The amount of time the students' projects involved and the degree of difficulty they perceived the project to be (on a six-point scale).
- **User Satisfaction:** The students' satisfaction with the results of their research project (on a six-point scale).
- **User Confidence:** The students' level of confidence in using either manual or online research methods (on a three-point scale).
- **Future Use:** The students' expected use of the research method in the future (on a four-point scale).

RESULTS

Preliminary and Final Bibliographies

- **Retrieval Size:** On average, the manual group found slightly more court cases than the online group. In the preliminary bibliography the manual group retrieved twenty-five cases and the online group identified twenty-two. In the final bibliography, the manual group listed five court cases; the online group cited four court opinions.
- **Precision:** In the preliminary and final bibliographies the faculty member evaluated the number of relevant court cases. For the preliminary assignment the faculty member judged a court case to be relevant if it discussed all or most of the legal issues involved with the student's topic. In the final bibliography the faculty member determined the number of landmark decisions listed and abstracted by the students. A judicial decision was considered a landmark case if it represented an important event or turning point in legal reasoning. The precision rate of relevant decisions is reported as a percentage of the retrieval size. T-tests, which compare the mean scores of two distinct groups, were used to analyze the results of the bibliographies.

TABLE 1
STUDENT MANUAL SEARCHING VERSUS STUDENT ONLINE SEARCHING:
A COMPARISON OF OUTPUT VARIABLES

Variable	Student Manual (N = 34)		Student Online (N = 35)		T Value	Significance*
	Mean	SD	Mean	SD		
Bibliography 1:						
Identify 20-25 cases on your topic						
Retrieval size	24.76	1.06	21.94	12.04	1.38	NS
Precision	18.38%	.16	94.46%	.20	-17.08	p < .00001
Bibliography 2:						
After reading the cases, select 5-10 most relevant						
Retrieval size	4.32	3.19	3.54	3.6	.95	NS
Precision	20.59%	.41	48.57%	.51	-2.52	p < .014

* Significance is $p < .05$

NS = No Significance

In the preliminary bibliography, the mean number of relevant decisions for the manual group was 18 percent; the result for the online group was 94 percent. This difference is highly significant ($T = -17.08$, $p < .0001$). The statistically significant difference between the scores of the online and manual groups on the preliminary bibliography verifies the success rate of online searches as a method of identifying relevant court cases on a particular topic by individuals with little or no background in a subject area (see table 1). In the final bibliography, the mean score for the manual group was 20 percent; the mean score for the online group was 49 percent. The difference between the groups on the final bibliography was significant ($T = -2.52$, $p < .05$). Individuals with little or no background in legal research who use online research methods do a better job of understanding the legal principles involved with a court case and evaluating the importance of these legal decisions than those using printed methods (see table 1).

Questionnaires: Indicators of Anxiety

The responses in the questionnaires of the manual and online groups were compared in relation to the following variables: amount of time spent on the search, ease of using the search method, satisfac-

tion with the results found by using the search method, confidence of using the search method alone or with the help of a librarian and expected future use of the search method.

- Time spent: Of the manual group, 46 percent ($N = 15$) reported spending six hours preparing and conducting their search; 34 percent of that group ($N = 13$) spent over ten hours. Of the online group, 88 percent ($N = 31$) spent three hours or less searching. A number of students from the manual group noted on their questionnaire that looking in printed materials took too long (see table 2).
- Ease of use: Thirty-five percent of the manual group ($N = 12$) found printed materials somewhat easy to use; 35 percent ($N = 12$) described them as somewhat difficult to use. Only 11 percent ($N = 4$) of the manual group found printed materials easy to use. In the online group, 34 percent ($N = 12$) found online searching easy to use; 40 percent ($N = 14$) found it somewhat easy and only 14 percent ($N = 5$) found it somewhat difficult (see table 2).
- Satisfaction: On the whole, both manual and online groups reported being satisfied or moderately satisfied with the results of their searching. From the manual group, 44 percent ($N = 15$) and 35

TABLE 2
FREQUENCY OF RESPONSES TO SURVEY QUESTIONNAIRE
ABOUT TIME, EASE OF USE, SATISFACTION, LEVELS OF CONFIDENCE,
AND FUTURE USE OF SEARCH METHOD

Variable	Student Manual Group (N = 34)	Student Online Group (N = 35)	Variable
1. Time Spent	6 hrs.	Online	1 hr.
	N %		N %
2. Ease of Use			Ease of Use
<input type="checkbox"/> Very Easy (VE)	3 9%		<input type="checkbox"/> Very Easy (VE)
<input type="checkbox"/> Easy (E)	4 11%		<input type="checkbox"/> Easy (E)
<input type="checkbox"/> Somewhat Easy (SE)	12 35%		<input type="checkbox"/> Somewhat Easy (SE)
<input type="checkbox"/> Somewhat Difficult (SD)	12 35%		<input type="checkbox"/> Somewhat Difficult (SD)
<input type="checkbox"/> Difficult (D)	3 9%		<input type="checkbox"/> Difficult (D)
3. Satisfaction			Satisfaction
<input type="checkbox"/> Very Satisfied (VS)	2 6%		<input type="checkbox"/> Very Satisfied (VS)
<input type="checkbox"/> Satisfied (S)	15 44%		<input type="checkbox"/> Satisfied (S)
<input type="checkbox"/> Somewhat Satisfied (SS)	12 35%		<input type="checkbox"/> Somewhat Satisfied (SS)
<input type="checkbox"/> Somewhat Disappointed (SD)	3 9%		<input type="checkbox"/> Somewhat Disappointed (SD)
<input type="checkbox"/> Disappointed (D)	2 6%		<input type="checkbox"/> Disappointed (D)
4. Confidence: Do search with help			Confidence: Do search with help
<input type="checkbox"/> Very Confident (VC)	12 35%		<input type="checkbox"/> Very Confident (VC)
<input type="checkbox"/> Moderately Confident (MC)	17 50%		<input type="checkbox"/> Moderately Confident (MC)
<input type="checkbox"/> No Confidence (NC)	5 15%		<input type="checkbox"/> No Confidence (NC)
5. Confidence: Do search alone			Confidence: Do search alone
<input type="checkbox"/> No Help (NH)	5 15%		<input type="checkbox"/> No Help (NH)
<input type="checkbox"/> With Help (W/Help)	26 77%		<input type="checkbox"/> With Help (W/Help)
<input type="checkbox"/> No Confidence (NC)	3 9%		<input type="checkbox"/> No Confidence (NC)
6. Future Use			Future Use
<input type="checkbox"/> All	6 18%		<input type="checkbox"/> All
<input type="checkbox"/> Many	20 59%		<input type="checkbox"/> Many
<input type="checkbox"/> Rarely	7 21%		<input type="checkbox"/> Rarely
<input type="checkbox"/> Never	1 3%		<input type="checkbox"/> Never

percent (N=12) reported being satisfied and somewhat satisfied, respectively. In the online group, 40 percent (N=14) and 29 percent (N=10) selected satisfied and somewhat satisfied, respectively. Fourteen percent (N=5) from the manual group selected somewhat disappointed and disappointed while 14 percent (N=5) from the online group selected very satisfied. A number of students from the online group further commented that their search method contributed to finding court cases quickly and helping to focus their research topic (see table 2).

- Confidence—alone and with help: Both groups were confident to moderately confident in using manual or online search methods alone or with the help of a librarian. In the manual group, 85 percent (N=29) rated themselves as very confident or moderately confident to do the search with help; 15 percent (N=5) reported no confidence. In terms of confidence to search alone, 15 percent (N=5) selected no help. In the online group 94 percent (N=33) described themselves as very confident or moderately confident to search with help while 6 percent (N=2) expressed no confidence. Twenty percent (N=7) selected confidence to search alone (see table 2).

- Future Use: Both groups of students were asked whether they would use their search methods in the future.

Of the manual group, 18 percent (N=6) reported that they would always use printed legal materials while 32 percent (N=11) of the online group responded that they would always use *LEXIS* (see table 2).

DISCUSSION

This study is unique in its comparison of manual and online searching. Previous studies have concentrated on users searching in their areas of specialization; such searchers produce higher precision rates using manual searching over online searching.¹⁷ However, in this study, where searchers are working outside of their discipline, precision rates are higher for online searching. In terms

of the duality of the interdisciplinary search task, the results of the study affirm that searchers without a background in legal research are more successful at finding cases and evaluating their importance by using online methods than by using print methods.

To complete the two bibliographies successfully, the students needed to find and evaluate court cases, even though they had no prior knowledge of law. This dual search task was further heightened because of the interdisciplinary nature of the project. The students needed to understand where the two disciplines—law and journalism—converged, what were the current developments in law that affected journalism, and what were the appropriate terms or principles. In light of the ISP, the superior performance of the online group over the manual group supports the authors' hypothesis that online search methods are more effective than manual search methods in helping researchers handle the challenges of interdisciplinary work to successfully complete their projects.

On average, the manual group found slightly more court cases than the online group.

Other research has recognized the presence of anxiety in users when seeking information.¹⁸ ISP recognizes that uncertainty and anxiety are fundamental elements of the search process and that users encounter inconsistencies and difficulties when seeking information. If the inconsistencies and difficulties are too threatening, the researcher may abandon a project entirely. This study's indicators of anxiety suggest that interdisciplinary researchers using online searching methods undergo lower levels of anxiety than those using print methods.

Comparing the two groups of searchers, this study found that online searchers expended less effort in terms of searching time and found online searching easier to use. These factors would help reduce frustration with the assignment. In

addition, this group was more satisfied with the results of its project. The online group cited court cases that were not available in the local library, and consulted law review articles for this research project; the availability of full-text secondary materials on LEXIS encouraged the online group to consult more sources. This would seem to support other research that indicates that the best approach for novice users is to conduct an online search and then use print materials.¹⁹ Searchers using online searching had greater confidence in their searching skills and were more apt to use online searching in the future. The study suggests that there is a relationship between the superior performance of interdisciplinary researchers using online searching methods and low levels of anxiety.

Comparing the two groups of searchers in this study on the effectiveness of online and manual research methods in interdisciplinary projects indicates further ways to investigate the relationship of interdisciplinary work and the library user. The research presented here focused upon novice users and interdisciplinary work. Further investigation needs to be made of expert users; do scholars involved with interdisciplinary projects perform better using online or manual searching methods? Also, this study should be replicated in other fields. Law is built upon a complicated, hierarchical information system. Other fields may not pose the same problems for the interdisciplinary researcher. An extension of this study,

for example, might compare the results of philosophy scholars investigating the philosophy of science by using the online and print versions of *Chemical Abstracts*. In addition, closer examination of the perception of the task at the beginning of the process may reveal greater understanding as to the relationship of anxiety and the final product. Lastly, a more detailed study of the elements of online searching may illuminate how this type of searching relates to the challenges of interdisciplinary work.

CONCLUSIONS

Miriam Drake observed that "interdisciplinary teaching and research teams can benefit from the input of a librarian who acts as an organizer, integrator, and interpreter in helping to bridge language and literature gaps."²⁰ In order for librarians to play a more active role in the process of interdisciplinary work, librarians must investigate this type of research as it relates to the theoretical and methodological approaches in library science. The proliferation of information and avenues for retrieving information have contributed to blurred boundary lines for all subject areas and it is becoming increasingly common for all library users to venture into subject areas outside their specializations. Further research by librarians into the nature of interdisciplinary work will add to the discussion within the academy and will help foster self-reliant and successful searchers.

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