The Cognitive Differences between the Processes Making Hyperlinking and Citing Decisions in Scholarly Environments: A Qualitative Study*

학술 환경 속에서 하이퍼링크와 인용 결정을 내리는 과정들 사이에 인식의 차이점들에 관한 연구

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ABSTRACT

The purpose of this research was to investigate cognitive differences between the processes making hyperlinking and citing decisions as perceived by scholarly authors themselves. 15 Indiana University faculty and doctoral students who had published at least one scholarly electronic paper containing at least one external hyperlink were interviewed. Four different types of hyperlinking behaviors were emerged from the interview data. The findings of the study revealed that there are no consensually agreed-upon conventions on the use of hyperlinks in scholarly environments although the majority of the authors tend to follow the implicit norms of conventional citation practices.

초 록

본 연구의 목적은 학술 환경 속에서 하이퍼링크와 인용 결정을 내리는 과정들 사이에 인식의 차이점들을 조사하는 것이었다. 적어도 하나의 외부 하이퍼링크를 포함하는 하나 이상의 전자 학술논문을 출판한 15명의 인디애나 대학 교수들과 박사과정 학생들이 인터뷰 되어졌다. 네 가지 다른 형태의 하이퍼링크 행위들이 그 인터뷰 자료에 대한 내용분석을 통해 확인되어 졌다. 비록 대다수의 저자들의 하이퍼링크 행위가 관습적인 인용 행태의 함축적인 규범들을 따르는 경향이 있음에도 불구하고, 학술 환경 속에서 하이퍼링크들의 사용에 대한 어떤 일치된 관례들이 존재하지 않고 있음이 본 연구를 통해 밝혀졌다.

keyword: hyperlink, citation, hyperlinking behavior, citing behavior, cognitive differences, scholarly communication

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1 Introduction

With regard to citations and their use in scholarly literature, numerous studies have been done and they have generally instantiated one of two major perspectives of citing: 'the normative view' and 'the microsociological view' (Cronin 1984). The normative view(Merton 1957; Hagstrom 1965; Kaplan 1965; Ravetz 1971; Cole & Cole 1973) holds that "the scientific community adheres to an implicit code of professional conduct, which guides individuals in the crucial and delicate matter of dispensing credits" (Cronin 1984, 54). According to the normative theory, scholars who use previously published work are obliged to give explicit recognition to the author of the work through citing it. The normative view has traditionally served as a dominant theory of citing in the scholarly community.

Based on the normative assumption that a citation reflects influence or impact of the cited work on the citing work, citation analysis has been widely used as a method to evaluate the quality, influence, or impact of scholarly work, to study the history of a subject, and to map scholarly networks, specialties, and disciplines(MacRoberts & MacRoberts 1987; Snyder, Cronin, & Davenport 1995). Despite the fact that the use of citation analysis for evaluative purposes has been common practice in many disciplines, it has also been an issue that has given rise to much controversy in the scholarly community(Garfield 1979; Smith 1981; Lindsey 1989; White 1990; Liu 1993a; Baird & Oppenheim 1994; MacRoberts & MacRoberts 1996; Cronin, Snyder, & Atkins 1997). The more recent emergence of the microsociological view (May1967; Thorne 1977; Bavelas 1978; Cronin 1984; Brooks 1985; Liu 1993b; MacRoberts & MacRoberts 1996; White & Wang 1997), which holds that citation is a complex process affected by various factors such as social and psychological motives, has posed a serious challenge to the normative view of citing. The advocates of the microsociological perspective of citing, who have questioned the validity of citation counting as a quality measure by casting doubt on the normative assumption itself for citation practice, have contended that citation cannot be simply used as an evaluation tool for scientific impact or influence(Thorne 1977; Cronin 1984; Liu 1993a).

With regard to the criticism of evaluative citation analysis based upon the complex and multidimensional citer motivations, however, White(1990, 90), who draws an analogy between citing and voting, argued:

> It is well known that there are various reasons for voting and various accompanying states of mind. In one kind of political study, it is perfectly proper to examine voter psychology and to categorize why votes were given. These

> correspond, of course, to the psychologies of citing mentioned above. But whole other classes of studies ignore the motivations underlying the votes and focus instead on the magnitudes and distributions of the vote counts. The fact that many votes were ill informed, perfunctory, and the like does not invalidate an election or render the study of election data meaningless. In other words, it does not matter to some scholars why the votes were given; what matters are the tallies and patterns that emerge over the whole electorate and perhaps over more than one election.

On the basis of the analogy, White concluded that the two normative and microsociological views lead to descriptions of reality that at some point become incommensurable. In similar vein, Cronin(1998, 45), who argued that "citations have multiple articulations in that they inform our understanding of the socio-cultural, cognitive, and textual aspects of scientific communication," has recently proposed metatheoretical approaches as a way of accommodating the different perspectives of citing.

On the other hand, the transition of the formal scholarly communication medium from the print medium to the Web-based electronic medium, which provides the hyperlinking capability, suggests a possibility of changes in scholars' traditional citation practices. Reference citations in text, which enable readers to locate the source of information in the reference list by citing by serial number(University of Chicago Press 1993) or author and date(American Psychological Association 1994), and a reference list typically located at the end of a paper, which usually contains all the bibliographic information necessary for unique identification and retrieval of the cited documents, may not be eventually necessary or required in a scholarly electronic paper providing hyperlinking capability because readers can go directly and easily from a hyperlink embedded in text to the hyperlinked document. In addition, hyperlinking in scholarly electronic papers makes it possible for the authors to provide readers with direct access to virtually any kind of electronic source, such as color images, sound files, and video clips, as well as the full text of electronic documents, which are available on the Internet. Therefore, the powerful hyperlinking capability in a Web-based scholarly electronic paper may allow the authors not only to dramatically expand their view of what is possible to be cited within a scholarly publication but also to change their view of the conventional citation practice in a scholarly publication.

As Small(1995, 118) states that bibliographic referencing is a natural application of the hypertext concept, hyperlinks on scholarly electronic papers may be considered the functional analogies of the traditional bibliographic citations which enable readers to identify, retrieve, and use

the cited documents by providing them with connections between citing and cited documents. Although the functional capability of hyperlinks and citations, which is to provide connections between hyperlinking/citing and hyperlinked/cited documents, is ostensibly similar, without enough understanding of hyperlinks and their use in scholarly electronic environments, we should be wary of drawing the hasty conclusion that hyperlinks in scholarly electronic papers are merely "online citations." In other words, there is no reason to assume that hyperlinks in scholarly electronic papers are functionally equivalent to citations.

Nonetheless, based solely upon the functional similarity of hyperlinks and citations, both of which provide links between two documents, there has been a general tendency to assume that hyperlinks are equivalent to citations(Jögensen & Jögensen 1991; Harnad 1992; Small 1995; Cameron 1997). Under this assumption, moreover, a number of studies have already attempted to apply the techniques of analysis developed for citations to the analysis of hyperlinks on Web pages in order to evaluate Web pages or to map scholarly networks (Larson 1996; Kuster 1996; Almind & Ingwersen 1997; Ingwersen 1998). However, it is unreasonable that in the absence of any knowledge about the nature, norms, and values of hyperlinks in scholarly electronic environments we expect someone to make sense of data derived from the application of citation analysis techniques to the analysis of hyperlinks.

Despite the fact that over the years numerous scholarly electronic papers have been available on the Web and hyperlinks and citations have been used together in many of the scholarly electronic papers, little research has been done on hyperlinking practices in scholarly electronic environments. Furthermore, in spite of the increasingly widespread use of hyperlinks in scholarly electronic papers(Hitchcock et al. 1998), there has been no research on hyperlinking behaviors in scholarly electronic environments with regard to the cognitive differences between hyperlinking and citing behaviors (Rousseau 1997). Before applying the traditional techniques of citation analysis to the analysis of hyperlinks, it is first necessary to investigate to what extent hyperlinking in scholarly electronic environments is analogous to citing. The study, which is designed to explore cognitive differences between the processes making hyperlinking and citing decisions in scholarly environments, not only provides an in-depth understanding of scholars' hyperlinking behaviors but also determines the ways in which hyperlinking in scholarly electronic environments can or cannot be considered analogous to traditional citing practice.

2 Methodology

2.1 Sampling Procedures

A purposive sample for qualitative interviewing was selected from the population of faculty and graduate students at the Bloomington campus of Indiana University who had published at least one scholarly electronic paper meeting the following criteria on the Web as of October 23, 1997:

(1) The paper should contain at least one external hyperlink. The purpose of the study was to investigate the cognitive differences between the processes making hyperlinking and citing decisions. Therefore, it was necessary that the interviewee should have hyperlinking experience.

(2) The paper should be published in an electronic-only publication with no print counterpart. Since the authors of scholarly electronic papers, which existed in two parallel forms, print and electronic, would have to consider the print counterpart as well, they may not fully utilize the capability of hyperlinking. Therefore, scholarly electronic papers which exist in two parallel forms were excluded from the sample. The paper should be peer-reviewed (or refereed). This included a variety of scholarly electronic papers, such as electronic journal articles and electronic proceedings of meetings and symposia.

(3) The paper should be published in 1996 or later. The paper used in the study should be as current as possible so that the interviewee accurately remembers the details about his or her hyperlinking behaviors.

In order to locate as many potential interviewees as possible, the study used the following two different techniques. First, HotBot[1], a Web search engine which not only provides a Boolean searching capability but also allows the user to narrow a search to documents created or modified within a specific date range and to look at all the retrieved documents without any limit in their number, was used as a primary method to locate potential interviewees. Almost all scholars who have published their scholarly electronic papers on the Web tend to put the names and addresses of their institutions and their electronic mail addresses on their papers. In addition, if it were a scholarly paper, it would almost always have an introduction section and a kind of reference section. Based upon these clues, the researcher built the following Boolean expression: "Indiana University" AND Bloomington AND "indiana.edu" AND introduction AND (note OR notes OR reference OR references OR bibliography OR

[1] It is available at URL Http://www.hotbot.com/.

bibliographies). Then the researcher ran a Boolean search narrowed to documents created or modified after January 1, 1996 on HotBot. This Boolean search on HotBot, which was conducted in October, 1997, returned 2,750 matches. In order to determine whether or not the retrieved electronic documents met the criteria established for selecting a sample, the researcher examined each of the 2,750 electronic documents retrieved and found only 13 documents which met the criteria.

Second, the researcher examined each Indiana University department's home page[2] and located eight additional scholarly electronic papers which met the criteria. Since each department's home page contains information on the publications of the faculty members, this approach was also an effective way to locate potential faculty interviewees.

Among the 21 potential interviewees identified through the Boolean search on HotBot and the investigation of each department's home page, 15 interviewees were selected as a sample for the qualitative study[3]. In selecting the 15 interviewees from the pool of all potential interviewees identified, a priority was given to include scholars from a diversity of both professional background and academic disciplines. The sample of the 15 interviewees, which consisted of three doctoral students and twelve faculty members, came from the following twelve different disciplines: Applied Health Science (1), Business (2), Chemistry (1), Computer Science (1), Education (1), English Literature (1), Law (1), Library & Information Science (3), Optometry (1), Philosophy (1), Psychology (1), and Recreation & Park Administration (1).

2.2 Qualitative Data Collection

This qualitative study employed in-depth, open-ended, semistructured interviews. The researcher did not employ a detailed interview guide in the interviews but the hard copy of one of the interviewee's electronic papers was used as a source for the interview. In addition, in order to help the interviewee's recall on his or her hyperlinking behaviors, the hard copies of the first pages of the source documents hyperlinked in the electronic paper sampled were provided. As an attempt to examine the cognitive differences between hyperlinking and citing behaviors in scholarly environments, the researcher directly asked each interviewee the following question: "When you write papers for the two different kinds of scholarly publication media, a Web-based medium and a traditional print medium, can you identify

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[2] The list of the academic schools, divisions, and departments at the Bloomington campus of Indiana University is available at URL http://www.indiana.edu/iub/academic/departments_schools.html.

[3] If the paper had more than one author, the author who made final decision(s) with regard to the use of the hyperlink(s) was interviewed.

any cognitive differences between the processes making hyperlinking decisions in a Web-based medium and making citing decisions in a print medium?" Both note taking and audiotape recording methods were employed in recording interview data. Verbatim transcriptions were made of the audiotaped interviews.

2.3 Qualitative Data Analysis

In order to analyze the qualitative data interviewed, content analysis, "a research methodology that utilizes a set of procedures to make valid inferences from text" (Weber 1985, 9), was used. The primary purpose of this content analysis was to develop a typology of cognitive differences between hyperlinking and citing behaviors in scholarly environments. Therefore, the unit of analysis was a cognitive difference between the processes making hyperlinking and citing decisions perceived by an author. As a method for developing categories, the researcher employed 'open coding' (Strauss & Corbin 1990, 61) which is an inductive coding technique: "[Codes] emerge out of the data rather than being imposed on them prior to data collection and analysis" (Patton 1980, 306).

After the initial development of the coding scheme, the researcher recoded all the unitized interview data according to the initial coding scheme in order to find "negative or alternative cases" (Strauss & Corbin 1990, 109) in terms of the general properties of the categories as well as to determine the intracoder reliability of the coding scheme. Unlike the first round of coding which relied only on analytic induction, in the second round of coding, the researcher employed both analytic induction and deduction in order to deductively verify the inductively generated categories against the data. The agreement coefficient between the two ways which the researcher coded and recoded was 93 percent. Based upon the results of the intracoder reliability test, the categories which showed disagreements between the coding and recoding were clearly identified and the points of ambiguity in their definitions were clarified.

Once the researcher was confident of the coding scheme, which consists of four different categories, a test of intercoder reliability[4] was performed by three independent coders in order to determine the extent of agreement among the coders regarding the assignment of units to categories. The results of the intercoder reliability test were checked for the extent of agreement using a procedure illustrated by Krippendorff(1980, 138-154). The agreement coefficient among the three independent coders was 84 percent, which is an acceptable level of intercoders'

[4] Although there is no absolute standard of reliability demanded, a widely accepted level of reliability seems to be 80 percent (Krippendorff 1980; Fraenkel & Wallen 1996).

consistency, particularly for an exploratory study(Krippendorff 1980).

2.4 Reliability & Validity in the Qualitative Study

As an attempt to improve the reliability, internal validity, and external validity of the findings of the qualitative study, this study selectively employed various techniques identified from the literature on the issues of reliability and validity in qualitative research.

2.4.1 Reliability in the Qualitative Study

In order to demonstrate how reliable and accurate the qualitative interviews were, the researcher re-interviewed each of the sampled authors(Fraenkel & Wallen 1996). The second interview was conducted at least one month after the first interview. Although it was very difficult to expect the exactly same responses from the two different qualitative interviews which were in-depth, open-ended, and semistructured, by and large inconsistencies over time in what the same interviewee reported would suggest that how reliable the interviewee was.

In the second interviews, the researcher asked the interviewees the same question as in the first interviews. The first and second interviews were conducted basically under the same conditions. Verbatim transcriptions were made of the audiotaped second interviews and the second interview data were analyzed and coded by the researcher. The cognitive differences between hyperlinking and citing behaviors investigated in the second interviews were directly compared with the ones explored in the first interviews and no significant differences between them were identified. Although it is not entirely fair to measure the reliability of the qualitative interview study by using the test-retest method, which is often used in quantitative research, in general, the interviewees' consistent answers over a one-month period should be viewed as sufficient evidence of the reliability of the qualitative interviews.

2.4.2 Internal Validity in the Qualitative Study

In order to ensure the internal validity of the findings of the qualitative interviews, a formal member checking, which is "the most crucial technique for establishing credibility" (Lincoln & Guba 1985, 314), was employed. After all the audiotaped interviews were transcribed and the data were analyzed, the researcher met with each interviewee individually for a formal member checking. With regard to the cognitive differences between the processes making hyperlinking and citing decisions investigated through the previous first and second interviews, the researcher individually checked them out with each interviewee in order to assess whether or not the researcher's interpretations of their answers were correct.

All the interviewees clearly agreed that the researcher's interpretations of their responses were correct and accurate. In addition, none of them suggested any changes of the categories in the member checking process. Thus, the internal validity of the researcher's interpretations of the cognitive differences between hyperlinking and citing behaviors investigated in the previous interviews was clearly established through the formal member checking.

2.4.3 External Validity in the Qualitative Study

The generalizability of the findings of the qualitative interviews would be improved by using 'between-method triangulation' (Jick 1983). In the second phase of the larger study, which employed qualitative and quantitative methods in combination, a quantitative mail questionnaire survey was used to investigate the hyperlinking behaviors of scholars in a wide range of disciplines. As Jick(1983, 139) argues that "survey research also contributes to greater confidence in the generalizability of [qualitative] results," the generalizability of the findings of the qualitative interviews would be enhanced by the supporting results of the subsequent quantitative mail questionnaire survey research.

As discussed earlier, in order to explore the cognitive differences between hyperlinking and citing behaviors, a series of qualitative interviews with the 15 different authors of scholarly electronic papers were conducted and altogether four different types of hyperlinking practices were identified from the qualitative interview data. These four different types of hyperlinking practices were confirmed by the results of the subsequent quantitative mail questionnaire survey(This report will be separately published later).

3 Results

Compared with the conventional citation practices, the scholars' individual hyperlinking practices were classified into four different types: (1) hyperlinking as a value added feature; (2) hyperlinking as a more casual form of citation; (3) hyperlinking as an extension of citing; and (4) hyperlinking as a more careful form of citation. In this section, the cognitive differences between the processes making hyperlinking and citing decisions as perceived by the interviewees themselves are described with quotations from the interviews.

3.1 Hyperlinking as a Value Added Feature

All the hyperlinks used in one scholarly electronic paper turned out to be created by someone other than the author of the electronic paper. In this case, hyperlinking was not a cognitive process involved in writing a

scholarly electronic paper. Without regard to the utility or quality of the source documents to be hyperlinked and the contexts of the hyperlinks within the hyperlinking electronic paper, hyperlinks contained in the scholarly electronic paper were mechanically created entirely not by the author of the electronic paper but by somebody else. Hyperlinking practice of this type was clearly described by one interviewee:

> It is the same reason for all of them. In other words I first constructed the footnotes that I needed without regard to whether I was hyperlinking. So I first cited everything that I thought I needed to cite to in the article. And then I actually had a research assistant go through and identify everything that was on the net. He put in a hyperlink to absolutely everything that was available on the net. So it wasn't an individualized choice. In other words, for me hyper-linking is just a convenience. It doesn't in any way relate to how important the Internet source was in generating the research for the article. ... I've never even gone back and looked at them. All I did was say take all of these footnotes and if any of them are on the Web, link to them. So I didn't even know what link to now. It was entirely done by somebody else. I just wanted the connections made where they existed. ... And so basically the footnotes were generated first entirely in a paper edition. And then any place where there was a footnote to something that was online, that was linked. ... This [paper] is very unusual. Virtually no legal publications appear only in electronic format. For example, we publish the Federal Communications Law Journal here. And we publish it in print and then we put it online. And when we put it online, we hyperlink everything. But it is just a convenience to the reader. The author doesn't even know we do it. It is entirely our student editors who do that. It is not done by the author or even with the author's knowledge. And I think that is fairly common. I mean that is largely how this happened.

As noted in the above quotation, the author neither consulted the source documents hyperlinked in the electronic paper nor chose which to hyperlink in the process of writing the electronic paper. Therefore, it is obvious that hyperlinking was not an integral part of scholarly communication. In this case, hyperlinking may be simply portrayed as a value added feature of the new publication medium.

3.2 Hyperlinking as a More Casual Form of Citation

Two interviewees seemed to consider that hyperlinking in a scholarly electronic paper is generally less significant than citing in a scholarly print paper because they believed that citations in a print paper are used primarily for supporting their statements or claims while hyperlinks in an electronic paper are usually used for referring the readers to just related works. Although the

cognitive difference between their hyperlinking and citing behaviors may also be influenced by some other factors, such as the subject matter of the hyperlinking paper or the availability of electronic source documents to be hyperlinked, it seemed to be very much dependent upon their own perceptions of the differences between the functions of hyperlinking and citing in a scholarly paper. With regard to the cognitive differences between their hyperlinking and citing behaviors, the two interviewees said:

> Hyperlinks and citations often serve very different purposes. Citations are usually references to related research that supports claims being made in the text. Hyperlinks might serve that purpose, but usually (I think) relate instead to other documents that discuss the same or a related issue. For example, here, when I said ISDN, I felt the need to explain it. So I made a link to this particular source which has a tutorial on ISDN. However, in a print-based paper, probably I would not have even made any reference to a book about ISDN because it is not an essential thing to illustrate what I am talking about in the paper. I mean the reader could read the paper without really knowing much about it. In a print-based paper, therefore, I would have just said ISDN and gone on and the burden would have been on the reader to know what ISDN actually is. The reason I hyperlinked the source was not because it directly contributed to our research. It was just related to the minor concept I mentioned in the paper. Let me point out the reason why some things are linked and some aren't. Because not all of them are on the Web. So whenever I find a related source document that is on the Web I will link to. Although it is very dependent upon the target links being available, in an electronic paper, I am slightly more likely to casually throw in a hyperlink pointing to additional information on a topic than I would be to include a citation pointing to the same information in a print-based paper if the information was not of direct relevance to the key points described in the paper.
>
> I realize that I tend to readily hyperlink within the context of my work to provide a direct link to a related source than I would do within a print medium. I realize that I do not always, however, cite this hyperlink source in a paper's references section. In citing print sources, on the other hand, I will make a systematic effort to identify the best sources that support my statements as succinctly and concisely as possible. Only where necessary will I include more than one supporting [print] source.

3.3 Hyperlinking as an Extension of Citing

The results of the interviews indicate that nine of the 15 authors interviewed tended to think that hyperlinking in a scholarly electronic medium is merely an electronic extension of citing in a print medium. Since

hyperlinks provide readers with easy and immediate access to the full texts of the source documents hyperlinked, if the source documents were available both in print and online, most of the interviewees preferred hyperlinking electronic sources to citing print sources in their scholarly electronic papers. For example, "In a Web-based paper, I would make a conscious decision to whenever possible create a hyperlink to things that I am citing as opposed to citing the same thing or something equivalent to that in print simply because it is easier for the user to find and to click on to read. It is a service to the reader."

On the other hand, the easy and immediate access mechanism of hyperlinks was also utilized for the hyperlinking authors themselves. They frequently used hyperlinks to save their efforts to summarize or describe the contents of the electronic source documents hyperlinked in writing their electronic papers. For instance, "I used the hyperlinks in this Web paper primarily to be lazy: I could just add a link to the referred-to research, rather than laboriously write a summary. In a paper medium, I'd probably have to summarize more carefully, because the referred-to research wouldn't be just a click away." Thus, whenever possible, most of the interviewees tried to take full advantage of the hyperlinking capabilities in their scholarly electronic papers.

Nonetheless, the scholars' own criteria (or standards) usually applied in making decisions about citing in a print paper seemed to be equally applied in choosing electronic sources to be hyperlinked in a scholarly electronic paper. Hyperlinking seemed to be regarded as an additional option which can be considered after all the conditions required for citing are satisfied. Therefore, many of the interviewees seemed to deem that hyperlinks in a scholarly electronic paper are no more than "online citations." Thus, the view that hyperlinking in a scholarly electronic publication is largely equivalent to citing in a scholarly print publication is apparent in the following interview quotations:

> The references that I have at the end of the article are text based. There is no way I could link those. Had there been a way, then I would have linked it. Just so people can go check out the original source online. The decision wasn't really conscious then. It was just mechanical. Does an online version exist? If it does, then make it a hyperlink. If it doesn't, use normal reference citations. Personally I don't think there is a difference.

> There are no really significant differences in the approaches taken. It is still necessary to give accurate links to the material cited, whether that is in a paper medium or on the Web.

> We basically made a hyperlink to the references that were available online.

I don't think I would use them differently. Where I would put a footnote in a printed article, I would put a hyperlink in a Web-based article.

I would not put in extra hyperlinks if I hadn't needed to cite something.

In general, in a scholarly electronic publication, I formulate citations for all same reasons I do so in a paper publication. And then I add hyperlinks when possible to those citations because it is a special value added feature of electronic publication, allowing greater ease in the use of the cited material which before could only be utilized in a more laborious, less immediate fashion.

I was certain that the resources that I used were appropriate resources and that I wasn't just padding it to make it look nice. I used the information from that hyperlink. I mean I was using information that was at that Web site. And then I was incorporating that into my paper. And then instead of just citing it and putting the reference in the back, I made a hyperlink to the Web site. My default was if there was a Web link, I would put all the Web links to make it easier for the reader to find that information. And then otherwise I would simply refer them to the hard copy information in the library. ... I don't see a difference in the inclusion of the citations and hyperlinks.

3.4 Hyperlinking as a More Careful Form of Citation

The majority of the interviewees treated their hyperlinking activities as part of their citation practices while three of them were generally more careful in making their hyperlinking decisions than in making their citing decisions. The possibility that the usefulness or relevance of the source documents hyperlinked in a scholarly electronic paper can be easily and immediately identified by the readers acted as a force that leads the hyperlinking author to make more careful hyperlinking decisions than he makes citing decisions in a print paper, as shown in the following quotation:

> I guess there is a subtle difference for us. In the print medium if I put down a citation, in my mind I know it is not likely that someone is going to look that up unless they are really very much into the topic, or that they are going to use as part of further research, or dissertation or something. Then they might go back and follow the citations. Whereas when we do it in an electronic journal and we have the opportunity to actually provide a link, we have much more confidence I guess that somebody is actually going to look up that article, because if it is print, what they have to do is see the article, turn to the reference page, go to the library, get it out, find it if it is even there, it is a lot of work. Whereas a hyperlink is just on the electronic document, all they do is a click and they

> are there. And they can check it out and then they can come back to the document and there is no effort, you know not as much time. So it is a little bit different than just a regular citation because it is more likely to be read by the readers because it is so easy to get to. I think we are thinking a little bit more because it is more likely to be read. Sometimes you know when you do an article for print media, you put in references and they may be marginally connected. But you really don't expect someone will read them. So you put them in. In an electronic journal, I am not likely to make a link to something where all they did was to take a tiny little quote out of it for one really minor point. ... In the electronic format I would link it only to those things that I really think the reader should go back and read. We are more careful in what we link.

Thus, this author's hyperlinking behavior suggests that the easy and immediate access mechanism of hyperlinking has the potential to make up for the problems of conventional citation practices, such as "lifting" (Hoerman & Nowicke 1995) or perfunctory citations (Moravcsik & Murugesan 1975).

In the sense that both hyperlinking and citing provide a connection between the hyperlinking/citing and the hyperlinked/cited documents, there would be no fundamental difference between the two activities. However, the easy and immediate connection mechanism of hyperlinking in a scholarly electronic medium allows the author to provide the readers with a "live context" which citations in a traditional print medium cannot do. The live context created by hyperlinking, which can be used as a way to help not only the author to more effectively make a point but also the readers to dramatically advance their understanding, may bring about changes in the process of writing a scholarly paper. The quest for effective utilization of the live contexts provided by hyperlinking may require even more intellectual effort in the process of writing a scholarly electronic paper. In this regard, one interviewee said:

> Hyperlinks allow a kind of cross-referencing that changes the content of the paper and the experience of the reader. For example, if the reader of my paper takes the link to the Rockwell painting, and jumps back to the paper, she can immediately see what I am talking about. Similarly, the Supreme Court case online allows a reader to jump right to a case, and back to the paper, which will likely change her understanding of the paper, and her view of its argument. So, even if cross-referencing aims at this in printed form, the hyperlinks allow the author to more dramatically make a point, and allow a reader a more immediate access to texts, images, and so on, which can advance the arguments in the paper. Thus, when writing a paper destined for the Web, the author(in this case, me) thinks how hyperlinks(text, images) might aid in making the arguments more vivid and

clear(especially since they can be accessed so quickly) in a way that printed media might not do. As a result, there is more discretion regarding hyperlinking in a Web-based paper. ... Of course, if this paper were in print form, the reader could also use a constitutional law text for learning about the other cases. Similarly, the reader could use a text of Rockwell's painting(or perhaps I could provide a copy for her) to see the picture I have in mind. So, technically speaking, the printed version of the paper, with two other volumes, could simulate the Web version of the paper. However, this simulation would require the reader to get those other texts, flip the pages back and forth, and so on. It is probably very likely that most readers wouldn't bother (unless they are really interested in the field). So, the Web page allows the reader to do quickly and efficiently what would otherwise take a longer time. Because of this, the impact of the paper might be greater, and the reader more likely to finish it, think it over, etc. In short, the hyperlinks in the Web-based paper advance more effectively the main reasons I wrote it: to convince others that free speech law is not what it is cracked up to be.

On the other hand, concern about the quality and volatility of electronic source documents to be hyperlinked obviously acted as motivators that force the hyperlinking author to be more careful in making hyperlinking decisions than in making citing decisions, as noted in the following quotation:

I think that there are two dimensions of this decision that are relevant. First, in citing a hyperlink there is more of a concern for the validity or accuracy of the source. My impression is that it is more difficult to evaluate whether to believe the [electronic] source. With print media it is much easier to evaluate this, since you know whether this is a refereed publication, etc. The second concern with hyperlinking is how permanent the hyperlink is. Since Web sites change constantly, a concern is that the URL address will exist in the future. I tend to be more conservative in selecting hyperlinks for these reasons.

4 Conclusions and Implication

Four different types of hyperlinking behaviors — hyperlinking as a value added feature, hyperlinking as a more casual form of citation, hyperlinking as an extension of citing, and hyperlinking as a more careful form of citation — were emerged from the interview data on the cognitive differences between hyperlinking and citing behaviors as perceived by the authors themselves of the scholarly electronic papers surveyed. Nine of the 15 interviewees deemed their hyperlinking practices as a simple extension of their conventional citation practices. In other words, the majority of the authors considered that hyperlinks in scholarly

electronic environments are no more than online citations, which can provide the readers with easy and immediate access to the cited works. On the other hand, the other six interviewees differentiated their hyperlinking practices from their conventional citation practices. Three of them were generally more careful in making their hyperlinking decisions while two tended to be more casual in making their hyperlinking decisions. In addition, all the hyperlinks used in one interviewee's electronic paper turned out to be created entirely by someone other than the author of the paper. In this case, hyperlinking was not a cognitive process involved in the process of writing the scholarly electronic paper. Thus, the findings of the qualitative interview study on scholars' hyperlinking behaviors compared with conventional citing behaviors reveal that there are no consensually agreed-upon conventions on the use of hyperlinks in scholarly electronic environments.

Since hyperlinking in Web-based scholarly electronic papers, which are a new publication medium for formal scholarly communication, lacks a set of established conventions of use, in using hyperlinks, many authors who have been already accustomed to conventional citation practices in print papers tended to generally follow the conventions of citation practices established in their own fields. They seemed to regard hyperlinking as an additional option which is usually considered after all the conditions required for citing are satisfied. In selecting electronic source documents to be hyperlinked in their electronic papers, therefore, many of the authors seemed to equally apply the criteria that are usually applied in making decisions about citing in their print papers. Thus, the findings of this hyperlinking study demonstrate convincingly that most scholars' hyperlinking practices in scholarly electronic environments are largely grounded in their conventional citation practices.

Nonetheless, this gross similarity of hyperlinking and citing practices must mask several significant differences between the two different acts. For example, one of the major advantages of hyperlinking is that it provides the readers with easy and immediate access to the full text of the source documents hyperlinked in scholarly electronic papers. Unlike citations in print papers, which require the readers to go through multiple inconvenient procedures (e.g., turn to the reference, search an online catalog, note the reference and its call number, go to the library, and so on) to access the full text of the cited documents, hyperlinks in electronic papers allow the readers to directly access the full text of the hyperlinked source documents by simply clicking on the hyperlinks. In the sense that the validity, relevance, or usefulness of the source documents hyperlinked can be immediately identified by the readers, the

relationship between hyperlinking and hyperlinked documents in scholarly electronic environments becomes transparent. The transparency of the relationship between hyperlinking and hyperlinked documents provided by hyperlinking would make it difficult for the author to simply select a source document to be hyperlinked based solely upon the name of an eminent author, which is one of the most important factors influencing print journal authors' citation behaviors(Vinkler 1987; Liu 1993b). In other words, the transparent relationship between the two documents established by the direct access mechanism of hyperlinking would influence the author to choose a source document to be hyperlinked based on more objective and impersonal criteria. Therefore, this finding suggests that hyperlinking in scholarly electronic environments has the potential to lead ultimately to a greater democratization of the scientific institution.

In order to obtain insight into the phenomenon of hyperlinking in scholarly electronic environments, this qualitative study, which was exploratory in nature, examined cognitive differences between the processes making hyperlinking and citing decisions. This study takes only a first step in exploring the unstudied phenomenon. Further research is needed to fully understand scholars' hyperlinking behaviors: It would be useful to investigate the patterns of hyperlinking in scholarly electronic environments for a better understanding of the phenomenon.

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