THE NEW LOGIC OF HYPERTEXT: ELECTRONIC DOCUMENTS, LITERARY THEORY, AND AIR FORCE PUBLICATIONS

THESIS

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The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U. S. Government.

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THESIS

Presented to the Faculty of the Graduate School of

Logistics and Acquisition Management of the

Air Force Institute of Technology

Air University

Air Education and Training Command

In Partial Fulfillment of the

Requirements for the Degree of

Master of Science in Information Resource Management

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December 1996

Acknowledgments

An academic research project is, in many ways, a collaborative effort, and I am grateful to all of those who so generously contributed their time and energy to this rewarding labor of love. I would first of all like to thank my advisor, Dr. David Vaughan, for his perceptive insight into the key issues of this study and his persuasive guidance that kept me from going astray. The other member of my committee, Dr. Alan Heminger, was particularly helpful in suggesting structural changes that would make the final product more readable, and I appreciate his help. I am also grateful to my classmates who always offered their assistance without complaint and with abundant good humor. One could not have asked for more amiable companions during this sometimes arduous journey.

Finally, I would like to thank the love of my life and the mother of my child for her unfailing inspiration and wondrous smile. My little girl's joyous interruptions were also a constant reminder of what is truly important in this world. To Judy and Shannon, I am indebted beyond words.

Gordon G. Geison

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Abstract

Hypertext systems offer electronic links that can instantly join related documents with the click of a mouse. Some observers predict that in the next few years hypertext will become the predominate technology of communication. Such a revolutionary transformation of our culture's basic system for sharing information is bound to have a profound and wide-ranging impact. At this early stage in hypertext's evolutionary development, no empirical study can be expected to capture the long-term implications of this new technology. An exploratory survey was distributed to 100 large corporations to gather their initial assessment of the revolutionary implications of hypertext. The results suggest that hypertext will lead to dramatic changes in users' experience of text. At this point, the nature of these changes can only be explored philosophically. This thesis examines the potential consequences of moving from a printed text to a hypertext environment in light of the literary theory known as "deconstructionism." This theoretical approach to the interpretation of text emphasizes the breakdown of the boundaries that seem to separate documents from one another. The illusion of isolated, self-contained, authoritative meaning gives way to an all-inclusive intertextual conversation. Hypertext provides the physical connections necessary to implement the interactive dialogue central to the deconstructionists' vision.

These issues directly concern the Air Force because it is developing a plan to disseminate its operating directives on-line in a system with hypertext features. This study concludes that the Air Force should implement this plan without delay.

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I. Statement of Problem

Introduction

The United States Air Force provides the most lethal and technologically-advanced war-fighting capability the world has ever known. Our aircraft offer unparalleled performance and our weapon systems can destroy enemy targets with remarkable accuracy and overwhelming force. However, if our high-tech warriors need to consult an Air Force publication containing crucial policies and doctrines, they may very likely have no choice but to travel to their location's centralized publications library and manually search through shelf after shelf containing large notebooks of printed textual information.

Paper-based publications are currently the predominant source for Air Force members to consult the vital information they need to perform their duties. Past proposals to use new information technology to eliminate this outdated, inefficient, and expensive method of distributing publications have not been fully implemented. Recent developments in network accessibility and data base integration offer the promise that the current unacceptable system can finally be abolished. The advance of technology, however, can often lead to unexpected consequences. Transforming an organization's fundamental system of information sharing can certainly be expected to have far-reaching

(and perhaps surprising) effects. The impact of a dramatic change in the way the Air Force produces and distributes its publications should be carefully examined to minimize any unintended negative consequences.

Historical Background

The recent explosive development in information technology has inspired many efforts to transcend the annoying limitations of antiquated paper records and move up to a utopian world of strictly digitized data. Various military and civilian organizations are exploring a wide range of technological options designed to eliminate (or at least dramatically reduce organizational dependence on) paper-based information systems (Levy and Marshall, 1995). The Air Force is certainly no exception to this wide-spread trend. In 1990, the Air Force's Director of Information Management identified the deficiencies of the Air Force's current publications system and proposed a new electronic distribution system based on CD-ROM technology (Ohotnicky, 1990:8).

Currently, Air Force publications (e.g., instructions, manuals, and forms) are printed at centralized locations, stored in warehouses, and then shipped to bases around the world where they are maintained in local publications libraries. Any minor revision to a publication must be sent out on a world-wide message and manually "posted" to the existing paper document. The problems with such a paper-based system are obvious: it is inherently slow, requires an inordinate amount of storage space, and depends on labor-intensive maintenance to keep publications up to date. Even more importantly, the current system simply does not fill the needs of the end user. Customers are forced to leave their work centers to travel to a centralized publications library and physically

search through numerous potentially relevant documents looking for the information they need. In the Director of Information Management's proposal, publications would be digitally stored on CD-ROM disks which would be sent to individual bases in place of paper documents. The end users at each base would then be able to access these CD-ROM files using key word queries through an "IM Net," which is essentially a local area computer network (Ohotnicky, 1990:8). The days of paper-based publications would be over. A distribution system relying on CD-ROM technology has, in fact, been implemented at various bases throughout the Air Force, including, for example, Wright-Patterson AFB, Ohio.

New Developments

When the Air Force's proposal for a CD-ROM based publications system was first suggested, many of those involved were convinced it took advantage of state of the art technology that would keep the Air Force on the leading edge of information distribution systems for many years to come--certainly through the end of the century (Ohotnicky, 1990:10). The advantages of CD-ROM storage and distribution over the existing system were so dramatic it was hard to imagine that a more effective alternative would be available within the foreseeable future. In the intervening years, however, a major new development has raised the very real possibility that the CD-ROM technology on which the proposal is based will be obsolete even before the system has been fully implemented. The information-sharing breakthrough that forces one to re-examine previous technological assumptions is the dramatic growth of networking capabilities, in particular the Internet and World Wide Web (Rao and others, 1995:35). These new resources allow

us to consider providing direct, on-line access from virtually anywhere to vast amounts of information. Easy on-line connectivity offers the potential of real time user access to large databases containing the entire Air Force publications library. Such an option was almost unthinkable just a few short years ago (Rosenthal and Reiner, 1994:168). The relentless advance of technological innovations has created an exciting new opportunity.

Electronic Publishing

To respond to the emerging advances in information technology, the Air Force, in 1993, initiated a plan to transform all its publications into digital format. The plan embodies the organizational vision of the future of Air Force publications and was issued as the "Air Force Electronic Publishing Master Program Guide" (1993). The Guide examines a wide range of technological issues relating to producing, disseminating, and accessing electronic versions of virtually all current publications. Various working groups provided reports relating to standards, infrastructure, products and media, and hardware considerations. The process has moved very quickly and by December 1996 a wide range of current publications will no longer be available in paper text--they will be accessible only digitally. The ultimate goal is to provide an Air Force-wide capability to access hypertext versions of publications on-line in real time (Harris, 96).

Technical Solutions

Thus far, the focus of Air Force planners has (understandably) been on the practical, technical problems that must be solved before the ambitious vision of on-line publication access can be fully implemented. Those involved have primarily been

technical specialists who are concerned simply with making the system operational. There has been very little time for, or interest in, more general, theoretical discussions of the impact the electronic conversion will have on those who write Air Force publications and those customers who must use them regularly. The assumption (as reflected in the Electronic Publishing Guide) has been that only the media of presentation will change; the essential style, format and content--the "logic" of the documents--will not be affected. The publications will simply be accessible in a new, more convenient way, and will be produced using faster, less costly procedures. Electronic documents, from this perspective, are simply digital replicas of paper documents, and the method of presentation has little or no effect on the users' perception of the information presented.

The Technology Question

This unexamined faith in the "neutrality" of the technology of written communication is not shared by most historians or professional researchers (Haas, 1996:6). In fact, social critics beginning at least with Plato have written dire warnings about the expected insidious effects of a change in a culture's method of producing, sharing, and storing information--while others have observed those same technologies and responded with celebratory endorsements, anticipating tremendous cultural benefits (Postman, 92: 4). However, whether the observers expect the technology under consideration to be ruinous or salutary, few believe that changing a culture's fundamental method of social communication will have no impact. Technology, from this perspective, is seldom neutral. If this is true, one could expect that transforming a document from paper to electronic media will alter (in some significant way) the users' encounter with

that text. This so-called "technology question" (Haas, 1996) concerns the nature and extent of the effect that various technological methods of presentation have on the users' basic experience and comprehension of the communicative act. While this core question has been debated for many years, the recent advent of electronic texts (and most especially hypertext) has given the discussion a new sense of urgency.

Research Question

This thesis will explore the philosophical, theoretical implications of the technology question as it relates to the use of hypertext and the Air Force's long-term plan to convert its publications system to this new technology. The central research question here is: How does the change in the technology of presentation affect the reader's interpretation of electronic (hypertext) documents as compared to paper texts?--and, specifically, how will the Air Force's transformation of its publications into hypertext impact the user's experience of those texts? The discussion will support the theoretical assumption that, compared to printed documents, hypertext leads to fundamental differences in the way readers perceive and respond to information. The argument will be that transforming a normal paper text into a hypertext document has profound implications. Electronic documents are not merely digital pieces of paper.

Thesis Structure and Investigative Questions

Even after extensive scholarly discussion (especially during the last several years), there is still considerable disagreement about what exactly is meant by the term "hypertext." The literature review in Chapter II, therefore, focuses on the basic

investigative question: What is hypertext? It presents an abbreviated history of hypertext and explores the surprising diversity of opinion concerning what the term includes.

Chapter III explains the research technique that guides this effort and offers a justification for the particular approach selected. The applicable investigative questions are: What is the research methodology that is operative in this study of hypertext and why is it appropriate?

While it is clearly premature to expect an empirical study to capture fully the ultimate implications of hypertext, at the same time it would not be prudent to ignore the (necessarily limited) experience of those who are actually using hypertext day to day to communicate information. The relevant investigative question is: How do various corporations view the impact of hypertext? Accordingly, I have conducted an exploratory survey of a significant sample of Fortune 500 companies that seeks to assess their early, tentative conclusions concerning the revolutionary implications of hypertext.. The survey also solicits their assessment of the wisdom of the Air Force's transformation of its publications to hypertext. The results of this survey will be analyzed in Chapter IV.

Several leading theorists of hypertext rely heavily on the insights of modern literary criticism to develop their positions (Landow, 1992; Bolter, 1991; Lanham, 1993). From their perspective, a document presented in hypertext bears a striking resemblance to the view of text developed primarily by the critical movement known as "deconstructionism" (Landow, 1992:2). The investigative question that animates Chapter V explores this relationship: What can literary theories suggest to us about the potential impact of hypertext?

The final investigative question focuses on the organizational relevance of this research project: What are the implications of the findings for the Air Force publications system? In addition to discussing the findings in relation to the specific needs of the Air Force, Chapter VI also examines the limitations of the current study and provides recommendations for future research efforts.

II. Literature Review: What is Hypertext?

History

Discussions of hypertext often begin with an acknowledgment of the remarkable article by Vannover Bush, "As We May Think," written in 1945. In this eerily prophetic description of a system he calls a "memex," Bush provides the theoretical foundations for the later development of hypertext. His imaginative machine is intended to allow scholars to achieve a measure of organization and control over the exploding body of information that modern research techniques produce. He complains that while scholars are creating "millions of fine thoughts," the diligent researcher is able to uncover only "one a week" because of inadequate methods of information retrieval (Bush, 1945:108). The problem, he suggests, is caused by the "artificiality" of the existing systems for information indexing (109). These indexing systems--whether alphabetic or numeric--do not reflect the way memory actually functions and lead to inefficiency and confusion: "The human mind does not work that way" (110). What was needed was a system that embodied the "intricate web" created by the often instantaneous "association of thoughts" that develop during the scholarly reflection on related texts (103).

In Bush's visionary construction, the memex (**mem**ory **ex**tender) depends upon a complex interaction of microfilm and photocell. The researcher observes a microform text projected on a screen. He can then quickly call up other related articles or individual pages of text onto an adjoining screen. If any of the projected texts inspires an "association," the researcher can easily key in a code number that creates a permanent

connection between the two documents (108). Any number of connections can be made, and the microforms with the encoded associations can even be shared with others who own a memex system (109). This process enables the researcher to create automatic, prompt cross-references between related items: "The process of tying the two items together is the important thing" (107). Bush is not satisfied, however, with simply relating documents to one another--the researcher is also enabled to append notes and marginal comments to the individual documents, and these personal observations are, in turn, permanently joined to the associated texts (108). The similarities between Bush's memex and modern hypertext documents are startlingly obvious.

Bush's ingenious device was never actually constructed, but his vision directly influenced the pioneers of computer hypertext such as Douglas Englehart, Theodor Nelson, and Andries van Dam (Nielson, 1995:36). Englehart, in fact, read the original Bush article in the Philippines as he waited for the ship that would return him to the United States after World War II (Nielson, 1995:36). For almost 20 years after Bush's initial vision of a memex, there were few obvious developments related to hypertext. Computers, of course, were becoming more powerful and accessible, but not until 1962 did Englehart begin work on his NLS (o**N**-**L**ine **S**ystem), which is a rather primitive precursor of hypertext (Nielson, 1995:36). When Englehart demonstrated his new program at the 1968 Joint Computer Conference, he essentially created a new field within computing and challenged his audience to pursue it.

The actual word "hypertext" was coined by Theodor Nelson in 1965 in conjunction with his work on the famous Xanadu Project (which he continues to develop

to this day). Xanadu is an ambitious effort to create a "docuverse" linking every single text in the world into one massive web (Nelson, 1992:53). Critics may scoff at the ultimate feasibility of such a project (Bolter, 1991:103), but no one doubts Nelson's key role in the evolution of hypertext systems. Another hypertext pioneer, Andries van Dam, is often credited with creating the first operational computer hypertext system. His Hypertext Editing System was built in 1967, ran on a small mainframe computer, and was eventually sold to NASA to store documentation relating to the Apollo moon missions (Nielson, 1995: 40).

Commercial applications of hypertext software did not appear until many years later with the introduction of KMS (Knowledge Management System) in 1983. Several other companies soon released competitive products including Symbolic Corporation's Document Examiner (1985); Conetics Corporation's Hyperties (1987); Xerox's NoteCards (1987); Office Workstations Limited's Guide (1986); and Apple's HyperCard (1987). Of these, the most widely used was undoubtedly HyperCard because Apple bundled it free into every Macintosh it sold from 1987 to 1992. Many end users were exposed to hypertext for the first time because of this marketing decision (Nielson, 1995).

In the early 1990s the proliferation of CD-ROMs with extensive connecting links significantly increased public awareness of and appreciation for hypertext technology. A significant milestone was reached in 1993 when hypertext encyclopedias actually outsold print versions for the first time (Nielson, 1995:34). Exerting an even greater impact than CD-ROMs, however, was the explosive growth of the World Wide Web beginning in 1991. The primary mode of navigating the Web involves the use of hypertext links, and

anyone who has sampled this massive network has been exposed to the basics of hypertext (Nielson, 1995:65).

Defining Hypertext

After 50 years of conceptual consideration, there is still surprising diversity among researchers about what exactly is included in the term "hypertext." This diversity has led to considerable confusion and miscommunication. Specific implementations of hypertext can include a wide range of features, and not everyone agrees on what constitutes "authentic hypertext." What theorists choose to include in their definition of hypertext is most often driven by what they see as the ultimate role of hypertext. This in turn is influenced by a wide range of philosophical, literary, and even political commitments.

Most researchers agree that "linking is the most important part about hypertext"(Landow, 1994:6), and it is the electronic link that most clearly distinguishes hypertext from the world of print technology. One theorist insists on this simple and straightforward definition: "Hypertext is merely a direct connection from one position in a text to another" (Aarseth, 1994:67). One can admire the simplicity of this position while still suggesting it is inadequate to capture the full range of hypertext features. Whatever its inadequacies, this definition does emphasize that a necessary (if for some, not a sufficient) condition for a document to be considered hypertext is that it allow the user to move automatically--electronically--from one point in a document to a different point.

The reader encounters a word or phrase that is highlighted and/or underlined (depending on the specific implementation), and with a click of the mouse she is immediately presented with additional information related to the highlighted entry in the original text. The new text that the reader leaps to by activating the link can in turn contain numerous links to other points--and so on indefinitely. Readers can navigate through a potentially infinite number of points by following the links that interest them. Each point in this web of interconnections is referred to as a "node" (Nielson, 1995:2), and by jumping from node to node a reader can create an endless variety of paths through a text. The information that a reader will encounter is determined by the particular pattern of nodes he selects. Each encounter with a text, therefore, becomes a customized version of that document unique to that reader during that particular session (Bolter, 1991:158).

Sequential versus Nonsequential Presentation

The freedom of selecting nodes allows the reader to approach the text from various directions in no specified order. This freedom breaks down the normal linear presentation of a printed text and replaces it with a new, "nonsequential," reader-determined trail of nodes (Berk and Devlin, 1991:5). It is possible, of course, to read a printed text nonsequentially, and some books (such as encyclopedias) contain numerous cross references that encourage a reading style that is logically similar to hypertext (Bolter, 1991:108). In most cases, however, the normal, expected reading path is the one selected by the author in arranging the pages in the particular order they appear. In printed text it is often inconvenient and time consuming to deviate from the linear

structure and search for related passages, pursue greater detail, consult glossaries, or refer to the end notes. All these activities can be made virtually effortless and instantaneous in hypertext documents.

This ease of exploring new paths tends to undermine a prescribed linear structure and encourages a more individualized, diverse, and nonsequential encounter with the hypertext document (Landow, 1989:174). Ted Nelson, the legendary hypertext pioneer discussed above, points to nonsequential presentation as *the* defining characteristic of hypertext (Berk and Devlin, 1991:5). The transformation of linear, print-based patterns of text ordering is clearly of tremendous theoretical significance. However, it can be argued that nonsequential presentation should more appropriately be considered an important potential *consequence* of hypertext, and not necessarily a defining characteristic.

The problem with focusing on nonsequential presentation as the distinguishing feature of hypertext is that a reader is not constrained to follow the available links in a nonsequential order. That is, a reader can simply scroll down a hypertext document, ignoring the available links altogether. One can read a hypertext document in a straightforward, linear fashion, much as one would read a normal printed text. In this scenario, the reader is not taking full advantage of all the hypertext features, but the document surely should still be considered hypertext regardless of the order of presentation selected by the reader. The implications of the nonsequential quality in hypertext will be discussed in greater detail in Chapter V.

Hypertext versus Hypermedia

In more advanced hypertext systems, the node that the reader selects need not be limited to traditional "text." The link can be configured to retrieve graphics, audio recordings, or even video clips. There is some disagreement among scholars about whether such multimedia systems should retain the name hypertext or whether a neologism like "hypermedia" should be used to describe them (McKnight, Dillon, and Richardson, 1991:2). There appears to be no etymological need to introduce a distinction between the terms. "Text" derives originally from the Latin word for weaving and for interwoven material (Landow, 1992:42). This etymology is obviously expansive enough to justify the inclusion of so-called hypermedia features such as graphics, audio, and video. Many scholars, in fact, choose to call all these systems hypertext and see no need for distinguishing systems with strictly textual nodes from those with hypermedia features (Landow, 1991; Nielson, 1995; McKnight, Dillon, and Richardson, 1991). Only time will tell whether usage patterns dictate the need for a distinguishing neologism. At any rate, in this discussion no distinction will be made between hypermedia and hypertext. The term hypertext will be assumed to include systems with nodes containing graphics, audio, and/or video as well as normal text.

Constructive Versus Read-Only Hypertext

In Bush's original description of his memex system, the researcher using the machine was not envisioned so much as a reader of the text, but as an active participant in creating the new linked documents. The researcher was not only able to establish the automatic connections between any documents desired, she was also able to append

comments and marginal notes that could be linked with the related items. Some theorists today insist that "true" or "completely realized" hypertext systems must be "constructive"--they must exhibit those same reader-empowering features described by Bush (Joyce, 1988; Bolter, 1991; Barrett, 1989; Landow, 1992, 1994). From this perspective, the ubiquitous link does not capture the full flavor of hypertext's potential. A system that does not allow for the active involvement of the user is no more than a "first approximation" of what hypertext will eventually become (Landow, 1992:7).

The user of a real hypertext must be able to create new, personal links to any documents he chooses, and he must be able to respond interactively with the documents such that his response can be made available to others who encounter the document: "The text rewritten by the act of choice becomes constructive hypertext--hypertext that is open to change and addition and revision, hypertext in which the authorship of the reader is made explicit" (Bernstein, Joyce, and Levine, 1991). "Readers," in other words, must be much more than "readers." They must be allowed to participate in a new, more creative interaction with the author of a text. (The shifting boundary between the author and reader will be examined more fully in Chapter V.)

Other researchers are not interested in establishing an interactive dialogue between reader and author, but simply in transferring the information contained in the text to the reader as effectively as possible (Glushko, 1989; Horn, 1989). The reader is not a partner in the creation of dynamic meaning, but the passive recipient of the author's wisdom. This approach insists that hypertext needs to be no more than read only because its purpose is merely to allow the transfer of the author's insights to proceed more

smoothly (Glushko, 1990:53). Hypertext will by no means dissolve the long-established relationship between author and reader; it will simply provide a more convenient system with which to present texts (Michalak and Coney, 1993). If the advocates of constructive hypertext are the radicals storming the gates of the oppressive printed text, the supporters of read-only hypertext are the conservative defenders of Gutenberg's world. By applying "engineering-like" discipline to the creation of hypertext networks, they are convinced that even complex texts can be divided and linked to maximize reader ease of use and comprehension (Horn, 1989:89).

Networked Versus Stand-Alone Hypertext

In addition to the crucial distinction between constructive and read only hypertext, the difference between networked and stand-alone systems must also be considered (Landow, 1994:9). A stand-alone system, such as one of the popular CD-ROM electronic encyclopedias, provides links to information contained throughout the confines of the CD-ROM. One can find an automatic link, for example, from an article on Gandhi to a related article on the history of India. While the memory capacity of these disks is impressive, it is still necessarily limited (Landow, 1994:11). The available links are restricted to a narrow range of the potentially-related items one might wish to access in the course of reading a particular article. While pondering Gandhi's development of the philosophy of passive resistance, one might find it useful to review the full text of Thoreau's famous essay on "Civil Disobedience." It is unlikely (to say the least) that any available electronic encyclopedia would have the complete version of Thoreau's essay or even any significant portions of it. The reader would have to find another source for the

required information or do without. The internal links provided by the encyclopedia could not reach beyond the boundaries of the CD-ROM and access the required text.

A networked hypertext system, on the other hand, would not be limited by the memory capacity of a single disk. If one is connected to the World Wide Web, for example, one can create links to a virtually inexhaustible and rapidly-expanding body of texts covering every subject imaginable (Landow, 1994:9). While the Web does not yet include the entire "docuverse" envisioned by Nelson, it does offer almost 400,000 Web sites with information resources comparable to a very large library (Feigenbaum, 1996). The expansive links this interconnectedness makes possible extend the boundaries of any particular text to include the full range of documents available on the network (Landow, 1994:11). For example, the current author (possessing very limited skills in network search techniques) was able to find the full text of Thoreau's "Civil Disobedience" in less than three minutes on the Web. By establishing a bookmark connecting this site to related sites on Gandhi, one could create a hypertext network that offers a much richer treatment of this Indian hero than could ever be possible within a stand-alone system. Networked hypertexts project an isolated text out into the larger context of countless related documents.

Additionally, a networked system allows more than one user to access a document simultaneously (Landow, 1994:11). Just as the text is isolated from all related documents in stand-alone hypertext, so also is the user cut off from all interaction with potential collaborators. Stand-alone systems offer only personal, private perusal with no possibility for communal interaction. A hypertext document on a network, in contrast,

can be reviewed and evaluated by an audience limited only by the size of the network. In other words, the text is not merely projected into a vast context of other *texts*, it is also placed among a vast digital gathering of potential contributors to its meaning--individuals who can comment and respond to the information presented.

What Is Hypertext?

The discussion thus far should make it clear that the question of a precise definition of hypertext is still a rather contentious issue. The field is still relatively new, and incessant technological advances often challenge our established linguistic conventions (Michalak and Coney, 1993). It is certainly too early to predict which of these various systems (if any) will become the standard of the future, and perhaps all of them will have a role to play in the future evolution of hypertext. They are not, after all, necessarily mutually exclusive. That is, different sorts of hypertext systems, with different features, might be appropriate depending on the specific needs of the situation.

The crucial concern is simply that scholars make it clear what kind of hypertext system they have in mind when they make assertions about its expected benefits, possible disadvantages, and overall impact. Too often, researchers "talk past" each other because they do not share a common understanding about what the term hypertext includes (Michalak and Coney, 1993:181). Until a more definite consensus emerges, researchers should make their assumptions about hypertext explicit.

The hypertext theorists who will be the focus of Chapter V are primarily interested in networked constructive hypertext. They are concerned with the impact of a fully interactive system that empowers readers and places texts in the largest possible

context. Stand-alone systems with merely internal links are not as philosophically significant (Landow, 1994). The "default" definition of hypertext used throughout the rest of this document will reflect this emphasis on constructive hypertext.

III. Methodology

Introduction

At this relatively early stage in the development of hypertext, a consideration of its ultimate impact is necessarily rather speculative and analogical. If one had asked even prescient observers in 1460 what the final impact of the new printing press might be, it is doubtful they would have imagined the full range of changes that would eventually accompany the triumph of the printed text as the dominant method of disseminating information in our culture. From an historical perspective, hypertext is of similarly recent development, and all assertions about its implications are somewhat tentative or even visionary.

Exploratory Research

Strictly empirical studies of hypertext have been done (Haas, 1996), but any conclusions they might support are problematic (to say the least) because virtually all eligible subjects for experimental study are firmly grounded in the regnant culture of print. Such studies might help establish how one imbued with a world view shaped by printed documents might initially respond to hypertext, but they cannot assess the full impact hypertext might have if or when it becomes a pervasive (or perhaps dominant) medium of presentation. It is of minimal value at this point, therefore, to focus on any particular application-level instantiation of a hypertext system.

However, while it would be unrealistic to expect an empirical study to unravel the specific nature of the potential consequences of hypertext, a preliminary, exploratory study can suggest whether those who actually use hypertext day to day are convinced it has revolutionary implications. Depending on the results, such a research project could then be used to justify (or question the need for) a more abstract, theoretical investigation of the *kind* of impact hypertext might have. Moreover, such a study could perhaps offer some guidance on the possible direction of future research efforts:

> Exploratory studies tend toward loose structures with the objective of discovering future research tasks. The immediate purpose of exploration is usually to develop hypotheses or questions for further research.... Exploration serves other purposes. The area of investigation may be so new or vague that a researcher needs to do an exploration just to learn something about the problem. Important variables may not be known or thoroughly defined. (Cooper, 1995:115,118)

The question of the impact of hypertext clearly fits many of the characteristics defined by Cooper to justify an exploratory study.

Population of Interest

The criterion used to select the appropriate population from which to draw the sample was the anticipated level of practical knowledge and experience related to hypertext. It was expected that a large corporation would have the resources and motivation to take advantage of a sophisticated new information technology that offered a realistic potential for practical benefits. Therefore, the sample was selected from among the list of Fortune 500 corporations. To restrict the list to only those companies that had specific experience with hypertext, the sample was chosen from a World Wide Web site

called the "U.S. Web 100" (http://fox.nstn.ca/~at_info/w100_uslist.html, maintained by the @Internet Marketing Corporation). This site contains a list of the 100 largest corporations in the United States who have a site on the World Wide Web. (The fact that these corporations maintained a Web site was considered evidence of their experience with hypertext.)

Sample Size

In an exploratory study such as this, it is difficult to define precisely the appropriate sample size (Cooper, 1995:205). Factors such as the precision of results desired and the available resources have to be considered (Cooper, 1995:207). After evaluating these variables, it was determined that the 100 companies on the U.S Web 100 list would provide a reasonable representation of the population of interest for the limited purposes of this study. The companies on the list include a wide variety of different business sectors.

Data Collection Method

Given the limited resources available, the most cost-effective means of obtaining the desired information was a survey. The design of the instrument was intended to solicit general background information about the organization and its use of hypertext documents. Additionally, the respondents' assessment of the impact, effectiveness, and revolutionary potential of hypertext was requested. The results of the survey are presented and briefly discussed in Chapter IV. The full survey is included in Appendix A.

Theoretical Investigation

The results of the survey reported in Chapter IV suggest that hypertext does indeed have revolutionary consequences. As argued above, exploring the nature of hypertext's impact requires a philosophical approach that examines the leading theorists of "the electronic word" (Lanham, 1993). The discussion of the technology question in Chapter V, accordingly, depends on a critical analysis of several prominent theorists of hypertext. Their work, in turn, has been heavily influenced by the literary theory known as "deconstructionism." Therefore, the philosophical inquiry developed in Chapter V includes a careful consideration of the deconstrucutionist approach to text.

IV. Survey Results

Background Information

Even if hypertext becomes a pervasive form of communication, it would still be difficult to design an empirical study that can confirm the theoretical implications of this new technology. The discussion in Chapter V, for example, will include such notions as the "empowerment of the reader," and the "diminishing authority of the text." These abstract constructs do not lend themselves to precise measurement or easy observation. At this initial period in the development of hypertext, the difficulties in devising a useful instrument to assess its impact are even more formidable. It is clearly unreasonable to expect any survey to capture the long term implications of a potentially revolutionary technological innovation while it is still, in a real sense, being "prototyped." At the same time, however, with more modest expectations, one could hope to gather some useful indicators of the best estimates of experienced users of hypertext. An exploratory survey can suggest if those in the field sense that this technology will produce dramatic changes. The kind of changes one can expect will then be philosophically examined in Chapter V.

Survey Participants

The hypertext survey was distributed to 100 Fortune 500 companies. Many of the survey recipients responded by stating that their companies had a corporate policy not to respond to any surveys. Others simply did not respond at all. Of the 100 surveys that were sent out, 25 were completed and returned. Of these 25, two indicated that their

companies had no experience with hypertext, and these two were therefore eliminated. This left 23 useable surveys. Of the 20 questions on the survey, the two that are of particular relevance to this effort are questions 15 and 16, which concern the companies' perception of the "revolutionary" nature of hypertext and whether the use of hypertext requires a new "logic."

Survey Questions and Tabular Listing Of Responses

1. What is the primary activity of your organization?

Table 1: Major Activity of the Organization

Type of Activity	Percentage of Respondents
Manufacturing	39%
Insurance	13%
Retail	9%
Services	9%
Computer	9%
Food Processing	4%
Railroad	4%
Electric Utility	4%
Communications	4%
Wholesale	4%

The respondents represented a wide range of industrial categories with a heavy concentration in manufacturing. Those involved in manufacturing produced everything from health and beauty aids to heavy appliances.

2. How many employees are in your organization?

Table 2: Number of Employees

Number of Employees	Percentage of Respondents
More Than 10,000	65%
5,001 to 10,000	13%
1,001 to 5,000	9%
501 to 1,000	13%
0 to 500	0%

Representing some of the largest corporations in the world, all the respondents had large workforces.

3. Does your company use hypertext (documents with automatic links to related documents) for internal and external distribution of information?

All the companies included in this analysis answered yes. The two returned surveys that indicated their companies did not use hypertext were dropped from the sample.

4. For what type of documents does your company use hypertext?

Table 3: Uses of Hypertext

Type of Use	Percentage of Respondents
Letters/Memos	43%
User Manuals	48%
Requests for Proposals	13%
Books/Publishing	26%
Regulations/Publications	43%
World Wide Web Site	100%
Electronic Database	61%
Technical Manuals	57%

The respondents use hypertext for a wide range of corporate functions. The percentages do not add up to 100 because the respondents could select more than one answer.

5. How long has your company used hypertext for distributing information?

Table 4: Years of Experience with Hypertext

Length of Experience	Percentage of Respondents
Less than 1 year	39%
1 to 2 years	17%
2 to 3 years	22%
3 to 5 years	17%
5 to 7 years	0%
More than 7 years	4%

The corporations represented in this survey have very little experience with hypertext. The overwhelming majority have worked with this new technology only three years or less.

6. Why did your company initially choose to use hypertext?

Table 5: Reasons for Initially Using Hypertext

Initial Reason	Percentage of Respondents
Required by upper management	4%
Compliance to a standard	0%
Anticipated improved accessibility	83%
Required by customer demands	22%
Competition	13%
Change in information technology	52%

The respondents clearly expected hypertext to improve the accessibility and effectiveness of their corporate information. The move to hypertext appears not to have been driven primarily by senior leadership, but seems to have come from the bottom up, motivated in part by the desire to keep up with to the rapid changes in information technology. The percentages do not add up to 100 because the respondents could select more than one answer.

7. How many hypertext documents does your company create each year?

Table 6: Number of Hypertext Documents

Number	Percentage of Respondents
25 or more	83%
11 to 24	9%
1 to 10	9%
None	0%

The categories provided did not really allow the respondents to provide a clear picture of the volume of hypertext documents they create. One respondent asked if the numbers were "in thousands" because they create hundreds of documents a week. For most respondents "25 or more" was not a very precise measure of their activity. The percentages do not add up to exactly 100 because the numbers were rounded to the nearest percentage.

8. **What percentage of hypertext documents do you newly create specifically for hypertext?**

Table 7: Percentage of Documents Newly Created for Hypertext

Mean	Standard Deviation	Median
54.13%	27.95%	50.00%

There was no clear trend at all in these responses. Some companies newly created 100% of their documents for hypertext, while others newly created only 10%. The data were widely dispersed across the entire possible range.

9. **Does your organization provide training on hypertext creation and use to its employees?**

Table 8: Percentage Providing Training

Training Program	Percentage of Respondents
Yes	43%
No	57%

All those companies with a training program said it was helpful. All those companies without a training program said it would be beneficial.

10. What resources has your company used to learn about hypertext?

Table 9: Learning Resources

Resource	Percentage of Respondents
Practice/Experience	100%
Co-workers	70%
Books	83%
Internet	65%
Newsletters	9%
Training/Seminars	65%

The companies drew on a wide range of resources to learn about hypertext. The percentages do not add up to 100 percent because the respondents could select more than one answer.

11. Do most of the companies you work with(and/or compete against) use hypertext?

Table 10: Competitors' Use of Hypertext

Used by Competitors	Percentage of Respondents
Yes	83%
No	17%

The overwhelming majority of the respondents' competitors make use of hypertext.

12. Has your company conducted a cost/benefit analysis of hypertext documents?

Table 11: Cost/Benefit Analysis

Cost/Benefit Analysis	Percentage of Respondents
Yes	26%
No	74%

Those few companies who had performed a cost/benefit analysis indicated the scope of the analysis was generally not corporate wide, but focused on smaller business units within the larger organization. The results tended to support the use of hypertext.

13. How would you rate the impact hypertext has had on the way your company's employees create and use documents? (Note: 1 is lowest impact, 10 is highest impact.)

Table 12: Impact of Hypertext

Mean	Standard Deviation	Median
5.35	2.81	5.00

The responses covered the entire range from 1 to 10. The most common response was 8, but it appeared on just 4 surveys. The median score reflects this lack of any clear trend.

14. How would you rate the effectiveness of hypertext in improving the distribution of information in your organization? (Note: 1 is lowest effectiveness, 10 is highest effectiveness.)

Table 13: Effectiveness of Hypertext

Mean	Standard Deviation	Median
5.22	2.98	5.00

Once again the responses covered the entire range from 1 to 10. The most common response was again 8, but it appeared this time on 6 surveys. There was certainly no consensus on the effectiveness of hypertext.

15. Based on your company's experience, do you think hypertext represents a revolutionary shift in the way information will be disseminated in the future--comparable to the invention of the printing press? (Note: 1 is not revolutionary, 10 is completely revolutionary.)

Table 14: Revolutionary Shift with Hypertext

Mean	Standard Deviation	Median
7.76	1.92	8.00

This is perhaps the single most significant question on the survey. The respondents clearly view hypertext as a revolutionary technology. Two of the survey participants chose not to answer this question, so there were only 21 responses to analyze. Of these, 15 were 8 or higher, and 8 were 9 or higher. The results of this question tend to confirm the theoretical conclusions of Chapter V which suggest that the impact of hypertext will be comparable to the impact of the printing press.

16. Has your organization discovered that the effective use of hypertext requires a new way of thinking, a new "logic"? (Note: 1 is no new logic needed, 10 is most definitely a new logic is needed.)

Table 15: New Logic of Hypertext

Mean	Standard Deviation	Median
6.95	2.91	8.00

Once again the results are unambiguous, although not quite as definitive as the data in question 15. Two of the survey participants again chose not to answer this question, so there were only 21 responses to analyze. Of these, 7 were 9 or higher, 10 were 8 or

higher, and 14 were 7 or higher. The respondents strongly support the position that hypertext implies a new logic.

(Note: Questions 17 and 18 solicited comments from the respondents concerning the benefits and problems associated with hypertext. Question 20 included a request for any additional information the respondent might like to share. Very few of the respondents chose to write comments. The comments that were included are collected in Appendix B.)

19. Based on your company's experience, would you recommend that the Air Force pursue its plan to transfer its governing directives to hypertext?

Table 16: Recommendation for the Air Force

Proceed with Plan	Percentage of Respondents
Yes	100%
No	0%

Three respondents chose not to answer this question. All 20 of those who did answer recommended the Air Force use hypertext to distribute its publications.

Summary Discussion of Survey Results

One of the most striking numbers among these survey statistics relates to the years of experience these major corporations have had with hypertext. Fifty-six percent of these companies have used hypertext for only two years or less. Seventy-eight percent have three years or less experience. Only one respondent has worked with hypertext for more than seven years. These numbers certainly reinforce the conviction that we are in the very early stages of the evolution of hypertext. It has only just begun to filter out of the research labs and into the commercial world. One would expect a considerable amount of confusion and misdirection during this incubation period. The rather unenthusiastic responses concerning the impact and effectiveness of hypertext (with mean scores of 5.35 and 5.22 respectively) may well reflect this initial struggle to find the appropriate implementations to serve corporate needs.

The surveys suggest that we are only at the beginning of the process that will determine whatever it is that hypertext will become. But it is significant that many of those who work most closely with this nascent technology already have a sense that something dramatic and even revolutionary is on the horizon. Many of the respondents, no doubt, would not be impressed with abstract notions such as the evanescence and tentativeness of an all-inclusive cultural conversation. Their responses do indicate, however, that they recognize the very real possibility that our fundamental system of communicating information may well be on the threshold of a radical transformation--a transformation with such profound and wide-ranging effects it will rival the impact of the printing press.

On the question concerning the revolutionary nature of hypertext, the respondents' mean score was 7.62, with a median score of 8.00. This clear consensus certainly supports the theoretical argument that the use of hypertext will fundamentally alter the user's experience of the text. Similarly, on the question of the new logic of hypertext, the respondents' mean score was 6.95, again with a median score of 8.00. Taken together, these scores reinforce the conclusions of those observers who see the appearance of hypertext as a major event in human cultural evolution. The limited experience of a significant sample of corporate America strengthens the academic argument regarding the far-reaching consequences of this new technology. The results of this exploratory survey clearly justify further research into the impact of hypertext.

V. The Impact of Hypertext

The Technology Question in History

In Plato's *Phaedrus*, Socrates shares the story of the Egyptian god Theuth, inventor of writing, bringing his discovery to King Thamus. Theuth enthusiastically proclaims that his wondrous alphabet will make the Egyptians wiser and improve their memories. The King, however, is not impressed. He insists that the alphabet will not bring wisdom, but rather will destroy memory, as pupils rely on the written word instead of using their own internal powers of recall. This new technology should not be welcomed as a miracle, the King proclaims, but resisted as a dangerous threat to learning (Plato, 1973:10). Plato's sympathies are clearly with the Luddite king and not the progressive inventor. This ancient call to resistance, however, was not heeded, and for better or worse the world embraced writing. The story captures the apprehension that often surrounds the transition to a new technology and demonstrates Plato's awareness that the medium of communication can have far-reaching impact on social structure (Haas, 1996:20). When a community changes its basic form of disseminating information, one should not expect such a transformation to be without consequence. In fact, the tremendous impact of the transition from an oral to a literary culture has been well documented (Ong, 1982; Havelock, 1982).

Eighteen centuries later an analogous cultural transformation began in the little German town of Mainz. A small print shop operated by Johann Gutenberg produces glorious manuscripts that rival the finest achievements of the medieval scribes

(Eisenstein, 1979:26). The age of printed text begins. Again there are those who are skeptical of the new technology and consider it a threat (Eisenstein, 1979:48). But the printing press, like writing before it, will not be denied. In less than a century the printed text becomes the predominate means of disseminating information in Western Europe (Eisenstein, 1979:73). The long-established traditions built around the manuscript slowly fade away and are replaced by a new world view defined by print (Eisenstein, 1979:71ff).

The characteristics of the culture of print so permeate our existence that they are sometimes hard to see (Eisenstein, 1979:16). Indeed, in a real sense it is *through* print that we see at all. Our structure of thought and discourse has been so shaped by the power of the book that only with difficulty can we step outside that interpretive framework and examine it (McLuhan, 1962). We often fail to recognize, therefore, that many of our most cherished assumptions and unexamined commitments about the nature of argument, the proper form of expression, and acceptable standards for information sharing spring not from disembodied reflection about the way things should be, but from a specific technology of communication that has achieved cultural dominance in the last few centuries (Landow, 1992:33). One could expect, therefore, that moving toward a new technology of presentation might well undermine the regnant paradigm of the printed text (Eisenstein, 1979:88).

While some observers may recognize that the transition from one medium of expression to another will not necessarily be a seamless process, others simply assume that the change in form will not significantly impact the fundamental meaning of a text. That is, some might feel threatened by the magnitude of the impending change, while

others simply deny that any important change will occur. Given our inextricable rootedness in Gutenberg's world (Landow, 1992:18), it is understandable that many of those who encounter the brave new world of electronic writing and hypertext automatically assume that presentations in the new medium will simply recapitulate the essential style, format and content--the "logic"--of the traditional printed text. The operating assumption is that the logic of a document is somehow separate from, independent of, the technology of presentation (Landow, 1992:33). Therefore, a simple change in the medium will not impact the basic meaning of the text. The medium, in other words, is *not* the message. Electronic documents, from this perspective, are no more than precise digital copies of paper documents.

This commitment to the neutrality of technology is, in many ways, similar to the initial approach of those involved in the early days of the printing press. Gutenberg's first Bibles were simply mass produced replicas of the glorious manuscripts created by the medieval scribes (Bolter, 1991:64). The typesetters even went out of their way to reproduce the exact script used by the scribes, even when that script made no sense in the context of print. For example, the early printers originally created over 300 ligatures and other abbreviations that were helpful to the scribes to make the text easier to copy, but were of no use--indeed were counterproductive--in bringing the text to print. Several decades passed before printers realized that these 300 confusing abbreviations made the text "easier to write (by hand) but harder to read" (Bolter, 1991:64). The printers simply could not bring themselves to abandon the accepted conventions of the manuscript approach to text, and they often allowed those conventions to define the form and

structure of their work. In fact, for many years, the prevailing assumption was that printed text was no more than a less expensive, more convenient copy of the traditional manuscript. It took some time for those who created books on the new printing presses to understand the potential for the new technology to alter the essential logic of the volumes they produced (Bolter, 1991:64). The printing press was not simply a faster scribe, and--as we shall see--electronic documents are not merely digital pieces of paper.

Hypertext and Literary Theory

It took generations for the intellectual heirs of Gutenberg to comprehend the inherent logical differences between the printed text and the scribal manuscript. One could expect a similar learning curve during the transition from print to hypertext. However, perhaps the timeline can be compressed if scholars are able to develop a clear philosophical understanding of the potential impact of this new technology. Several such efforts have been made, and they all draw heavily on the work of modern literary critics, especially the group known as the "deconstructionists" (Bolter, 1991; Landow, 1992; and Lanham, 1993). The remainder of this section will focus on what one observer calls the "convergence of contemporary critical theory and technology" (Landow, 1992). In other words, what can these literary theories suggest to us about the potential impact of hypertext?

The Characteristics of Printed Text

One of the early effects of the transition to print was an increased focus on establishing and forever fixing the true text of great works (Eisenstein, 1979:117). Much

scholarly effort since Gutenberg has been concentrated on this effort to uncover the original words of an ancient author, freed from the distortions of scribal errors and emendations. The hope remains that once the "real" text can be determined, it can then be frozen into print so every reader henceforth would encounter the exact same book (Landow, 1992:18). For works that were written after Gutenberg, of course, the task was less daunting, for presumably the author's manuscript would proceed directly into print, with no opportunity for the accumulation of errors (with the exception of mistakes in typesetting) (Eisenstein, 1979:81).

The emphasis on fixity and the stability of text associated with print has significant collateral effects. For example, it establishes a more definite claim for unique authorial property and led historically to the enactment of copyright laws: "The terms plagiarism and copyright did not exist for the minstrel. It was only after printing that they began to hold significance for the author" (Eisenstein, 1979:121). As works for the first time were legally assigned to particular individuals, the traditional notion of communal authorship was slowly abandoned (Eisenstein, 1979:122). Prior to the Fifteenth Century, for example, no one would have thought to ask who wrote the Biblical stories. A culture's literature developed over many centuries with constant changes to reflect an evolving social structure--the question of original authorship was simply not an issue in most cases. With printing and copyright, however, came the need to differentiate one work from another, the legal obligation to ensure that each book had precisely-defined boundaries that separated it from every other book (Eisenstein, 1979:122). With legal

walls erected to prevent unauthorized appropriation of another's work, texts ostensibly become more isolated and cut off from the possibility of creative interpenetration:

> By insisting on a written surface, detached from any interlocutor, making utterance in this sense autonomous and indifferent to attack, writing presents utterance and thought as uninvolved with all else, somehow self-contained, complete. Print, in the same way, situates utterance and thought on a surface disengaged from everything else, but also goes farther in suggesting self-containment. (Ong, 1982:132)

The self-contained text resists dynamic evolution. Stories can no longer be changed by the community to reflect new conditions. Socially-advantageous additions to existing cultural legends can no longer be easily inserted. The evolving communal story is replaced by the permanently-fixed, individually-owned text.

As the text becomes an individual possession, the role of the reader also changes. No longer an active participant in a community-sanctioned ritual of recitation and response (Eisenstein, 1979:131), the reader is reduced to the passive recipient of the wisdom handed down in weighty tomes: "Printing also tended to magnify the distance between the author and the reader, as the author became a monumental figure, the reader only a visitor in the author's cathedral" (Bolter, 1991:3). As the gulf between author and reader widened, the author's words acquired increased authority and became harder to dismiss (Bolter, 1991:149). Even the physical presence of the text itself conveys an impression of self-sufficiency, completeness, and closure (Bolter, 1991:86).

In addition to suggesting authoritative completeness, the physical structure of the book also encourages a sequential approach to the presentation of information and argument. Generally, a book is read from the beginning to the end. The most obvious

and convenient way to experience a printed text is simply to turn one page after another. There is no easier way to move around from section to section. The existence of this powerful structural convenience very likely leads to significant conceptual consequences. It is arguable, for example, that Western culture's bias toward linear expression and straightforward a→b→c displays of reason has been influenced in some fundamental way by the typical structure of the printed text: "McLuhan's suggestion that scanning lines of print affects thought processes is at first glance somewhat mystifying. But further reflection suggests that the thoughts of readers are guided by the way contents of books are arranged and presented" (Eisenstein, 1979:88).

To sum up this broad historical sketch: Gutenberg's printing press created a world of stable, authoritative and legally-isolated texts, centered on the individual author as the source of knowledge, and allowing the reader little opportunity for creative interaction. It is the world we inhabit still--but perhaps not for long.

The Deconstruction of Text

Even before the wide-spread appearance of electronic documents, the deconstructionist literary critics were uncomfortable with the perception of text encouraged by the traditional printed book. They were convinced that the image of the magisterial author delivering a tidy package of truth closed off from the voice of the reader and from the influence of other texts was a serious distortion of the communication process (Bolter, 1991:86). Protective copyright laws and the physical, discrete concreteness of the book notwithstanding, the deconstructionists still insist that texts can be appropriately understood only when viewed "as intertextual constructs" (Culler,

1981:38). That is, the supposed isolation of the text is, in one sense, merely a convincing optical illusion, a dangerous façade hiding the essential interconnectedness of all texts.

Derrida, perhaps the leading voice of the deconstructionist critics (and a writer not generally noted for his clarity of expression), explains the expanding concept of text:

> The question of text, as it has been elaborated and transformed in the last dozen or so years, has not merely touched 'shore,'...all those boundaries that form the running board of the what used to be called text, of what we thought this word could identify, i.e., the supposed end and beginning of a work, the unity of a corpus, and so forth. What has happened...is a sort of 'overrun' that spoils all these boundaries and divisions and forces us to extend the accredited concept, the dominant notion of a 'text'....[A] text that is henceforth no longer a finished corpus of writing, some content enclosed in a book or its margins, but a differential network, a fabric of traces referring endlessly to something other than itself, to other differential traces. Thus the text overruns all limits assigned to it.... (Derrida, 1979:83-84)

The deconstructionists were committed to breaking down the deceptive "boundaries" that appeared to isolate a text from the larger cultural context from which it evolved and in relation to which it must be read. Ultimately, this concentrated effort to eliminate the artificial walls of separation between texts suggests the irrelevance of any distinction between the "inside" and "outside" of any particular text (Landow, 1992:8). Every text is included in, implied by, defined in relation to, every other text (Hartman, 1979:viii). A particular text is merely a thread in the seamless fabric of cultural expression. (One should recall here the etymological roots of "text" as "weaving or the material weaved.") A single thread severed from the context of the fabric it helps bind loses its essential function. Similarly, an isolated text is a meaningless abstraction when analyzed apart

from the cultural network from which it springs. With the deconstructive approach, the well-defined edges of the text begin to dissolve.

But the very image of a textual "edge" betrays a prejudice inappropriate to the deconstructionists' project. An edge--even an edge that is dissolving--presupposes a unified inner text neatly distinguished from those various texts residing outside it. For the deconstructionists, however, it is not merely the walls separating texts that are collapsing. The dissolution of boundaries occurs not only *between* texts, but also *within* texts. The individual units of meaning which form a larger document "can break with every given context, engendering an infinity of new contexts in a manner which is illimitable" (Derrida, 1977:185). Derrida is suggesting here that the "given context" established by the author by no means exhausts the potential relationships in which that elemental fragment of meaning has relevance and can offer illumination.

Particular passages within a text can separate into discrete entities and break through the permeable walls of the overall document to be understood within a larger context of meaning. The vaunted stability of the printed text begins to disintegrate. The text, in a sense, is being pulled apart as it simultaneously forms closer ties with the texts of other authors. At the same time the text as a whole is being drawn into the larger cultural conversation, its constituent "subtexts" atomize and likewise join the communal creation of meaning:

> Text--or, more properly, passages of text--that had followed one another in an apparently seamless linear progression now fracture, break apart, assume more individual identities. (Landow, 1992:53)

It is not, after all, simply a particular text that is a thread in the seamless fabric of cultural expression; it is the atomized block of meaning that forms texts which is the foundation of the unbroken weave at the heart of social communication. Freeing the individual subtexts from the larger document breaks down the author's original structure and enables a virtually endless, nonsequential refashioning of the component units of meaning.

This generalized dispersal of text into the vast social field of expression tends to undermine the unique authority of the individual author. When a text is irrevocably situated within a vast network of other texts, it no longer offers univocal pronouncements aspiring to truth; rather, it is engaged as a part of a complex cultural dialogue (Landow, 1992:63). The magisterial proclamation is transformed into an all-inclusive conversation. The text becomes the transient center for a multivocal exchange of ideas. Moreover, as the conversation expands, as the boundaries break down and texts "overrun" into one another, the putative fixity of the individual text also begins to dissolve. Indeed, the imagery of conversation and constructive dialogue suggests a softening of the text's hierarchical rigidity and a concomitant malleability. When the text is fully subject to criticism, clarification, and refutation, there is an implicit openness to reevaluation and revision. The author's voice is infused with an air of tentativeness and exploration, appropriate for one engaged in a diverse conversation that includes a full range of participants, with no one in a privileged position. As the individual author's power is diminished, readers are endowed with a corresponding freedom to choose the thread of discourse that interests them, rather than accept the claims of the one author whose work they are directly encountering at that moment (Bolter, 1991:158).

The Limits of the Deconstructionist Vision

The deconstructionists offer often compelling insights into the nature of text that challenge the facile assumptions of Gutenberg's world. However, their romantic vision of the expansive power of text is less than convincing. Indeed, it seems "particularly abstract and difficult when read from the vantage point of print" (Landow, 1992:53). For one thing, it is not always clear whether their assertions are intended to be strictly descriptive of the way text does function or are in fact prescriptive of the attitude one should assume in considering texts. In either case, their theoretical claims do not generally ring true to one's actual, direct experience of most textual documents.

It may well be the case, at some level, that every text is engaged in a mutually enriching dialogue with the full range of cultural expression. Virtually every book grows out of and responds to a certain intellectual stream of concern. Its publication, in turn, often inspires further reaction and written response. This process can be metaphorically compared to a "conversation." One would venture to suggest, however, that most readers, even those who are intimately familiar with a great deal of a culture's expressive output, do not have the sense of participating in a conversation as they read a text. The printed page is simply too abstract and unresponsive to think of it in terms of dialogue. In fact, one could argue that the utter indifference of the text leads not to a sense of dialogue, but merely to frustration at one's inability to reply to the words on the page:

> The author might be challenged if only he or she could be reached, but the author cannot be reached in any book. There is no way directly to refute a text. After absolutely total and devastating refutation, it says exactly the same thing as before. This is one reason why 'the book says' is popularly tantamount to 'it is true.' It is also one reason books are burnt. A text

> stating what the whole world knows is false will state falsehood forever, so long as the text exists. (Ong, 1982:79)

Those atomized units of meaning might be reaching out to a larger context, but without a practical means of making the connection, the outreach is strictly conceptual and symbolic. The deconstructionists can insist that there is a high level textual dialogue occurring--that all the boundaries separating texts have been broken--but the individual reader is left staring at the same isolated printed page as before. The deconstructionist challenge to the stable authority of the text is an impressive theoretical exercise, but it is ultimately undermined by the immutable physical resistance of the printed text.

The Deconstructionists' Message Finds Its Medium

The argument developed above suggests that to speak of an all-inclusive textual conversation sounds splendid, but without a physical system to provide the contextual links, the deconstructionists' vision remains abstract and unpersuasive. Remarkably, however, years after the crucial deconstructionist texts were written, a communications technology has arisen that is "an almost embarrassingly literal embodiment" of deconstructionist principles (Landow, 1992:53). The deconstructionists' project depends upon a system that can overcome the physical limitations inherent in printed text. It requires a system that allows unlimited interconnections between the elemental units of meaning. It anticipates a system that implements the essential intertextual dialogue. Hypertext has the potential to be such a system.

The theoretical interpenetrability of text proposed by the deconstructionists becomes a practical reality in the world of hypertext. The boundaries truly do begin to disappear:

> [Hypertext] dissolves notions of the intellectual separation of one text from others in the same way that some chemicals destroy the cell membrane of an organism: destroying the cell membrane destroys the cell; it kills. In contrast, similarly destroying now-conventional notions of textual separation may destroy certain attitudes associated with text, but it will not necessarily destroy text. It will, however, reconfigure it and our expectations of it. Another related effect of electronic linking: it disperses the text into other texts. As an individual lexia loses its physical and intellectual separation from others when linked electronically to them, it finds itself dispersed into them. The necessary contextuality and intertextuality produced by situating individual reading units within a network of easily navigable pathways weaves texts, including those by other different authors and those in nonverbal media, tightly together. One effect of this process is to weaken and perhaps destroy any sense of textual uniqueness. (Landow, 1992:53)

Hypertext dissolves the "cell membrane" of the isolated text and joins the whole document (or selected subtexts) to the broad world of cultural expression. The very notion of "text" becomes problematic as the presence of links so intertwines documents as to make them indistinguishable. The constituent threads of the seamless fabric of texts become hard to differentiate. Derrida envisions text as situated in a network of "traces" (individual units of meaning) that are "referring endlessly" to something other than themselves (1979:84). Hypertext links can join every passage in a text to a chain of links that can include a virtually illimitable array of other subtexts. Derrida's vision has found its physical embodiment:

> The link indicates the implicit presence of other texts and the ability to reach them instantly. It implies the jump. With the jump, all texts are virtually co-resident. The whole notion of a primary and secondary text,

> of originals and their references, collapses. In magnetic code there are no originals, no primary, independently existing documents. All texts are virtually present and available for immediate access. The original text is merely the text accessed at the moment, the current center of focus. Hypertext is electronic publishing in an ever-growing, interconnected whole. (Heim, 1993:35)

Every text can include every other text not just symbolically or metaphorically, but with the physical structure of an electronic connection providing real time access. The all-inclusive conversation the deconstructionists hope for can begin.

The End of the Fixed Text

One of the central features of the current paradigm of print is the long-term stability of the printed text. Once a work is fixed in print it remains forever the same. The deconstructionists seek to undermine this static icon by emphasizing the unending textual dialogue that alters the boundaries between and within ostensibly fixed documents. Hypertext has the potential to go beyond this conceptual interaction and directly impact the structure of the text itself.

The first consideration relates not exclusively to hypertext but to electronic documents in general. The instant editing features of word processing applications discourage any effort to precisely define a text while it is on screen. The virtually effortless deletion, insertion, and rearrangement functions give to computer-displayed text an uncertainty and evanescence relative to the physical reality of print:

> Once printed, paper text is fairly static. It presents the same face to all readers, so that my copy of a book looks like yours. In contrast to the static quality of paper text, on-screen text is fluid and customizable,

> updatable, and expandable. These qualities...give an elasticity to electronic text that changes the nature of publication. .... The fluidity of the screen has begun to overcome the static inertia of print. (Bernhardt, 1993:173)

The dynamic mutability of words and images on a monitor imbues the text with a sense of tentativeness and fleeting impermanence. The text one encounters in this moment could be dramatically altered the next. The reality of the screen is less absolute than the reality of the physical text. The electronic words flow endlessly and resist capture: "The leaf on the river is not the leaf plucked out and held in the hand" (Birkets, 1994:159). In electronic writing, there is no final way to determine what the "real" text includes.

The second factor in hypertext's assault on the fixed text concerns the structural implications of reader-selected links. By allowing readers to define the path through which they will encounter a document, hypertext overturns any effort to predetermine the precise boundaries of the reader's experience (Bolter, 1991:158). The physical limitations that made turning one page after another the most convenient means of navigating a document no longer apply. The ordinary linear structure of the text becomes permeated with links such that the reader can immediately access a vast pool of related items of interest. There is no longer a need to follow the author's words from beginning to end. The accepted a→b→c structure of Gutenberg's world breaks down as readers define their own path through the maze of interconnections. It is just as likely that the reader will choose to navigate from a→d→m→b or any of an infinite number of other paths. Two readers who experience the "same" text may follow entirely different links as they make

their way through the document. It is no longer the same text. The unalterable fixity has been compromised.

In addition to this freedom to choose among endless available paths, in constructive hypertext systems the reader also has the power to create new links that will allow future readers to explore connections never imagined by the original author (Landow, 1992:178). Moreover, readers have the ability to respond directly to the documents they experience and connect their response to the original text. This interactive process would certainly seem to approximate the intertextual conversation envisioned by the deconstructionists.

Reader Empowerment

Constructive hypertext reconfigures the relationship between the author and the reader. The reader is no longer simply a reader. She can become an equal partner with the author (and with other partners who encounter the text) in creating the dynamic meaning that will emerge from their on-going conversation. Ultimately, constructive hypertext calls into question the very notion of unique authorship--when we do not passively accept the words and images we encounter, but rather respond interactively with changes, challenges, and suggestions, then the normal distinction between reader and author begins to break down and must be redefined (Landow, 1992:33). Indeed, it might be more appropriate to call those who participate in the dialogue established by constructive hypertext "collaborators," or perhaps "contributors." The evolving text that emerges from this interaction is, in a real sense, a collaboration among all those who encounter the text and choose to respond. In hypertext systems, the empowered reader is

no longer a passive recipient of the text as delivered by the author, but is actively involved in choosing the structure that the text will take and shaping the words and images that will determine its growing meaning (McDaid, 1991:456).

The Diminished Authority of the Text

The enhanced power of the reader (or "collaborator"), the full implementation of an intertextual dialogue, and the evanescent tentativeness of the hypertext document lead inevitably to a reduction in the perceived authority of the text. The monumental printed text, resplendent in its impressive physical completeness, does not encourage challenge or response. It offers no direct means for the reader to question or criticize. The incontestable text delivered by the author presents a univocal perspective that cannot be corrected or clarified by further input (Landow, 1992:11). The author dominates the audience's experience of the text because the reader is given little choice but to accept the meaning and structure of the document as presented. The errors and distortions of the permanent text will remain errors and distortions as long as the document exists. It is forever fixed in its final form, and while readers do not have to believe what the text says, they cannot expect to ever change its message. There is an unbridgeable gap between the author who creates and the reader who can only receive (Bolter, 1991:101). All these attributes tend to reinforce the authority of a printed text.

The hypertext document, in contrast, "does away with certain aspects of the authority and autonomy of the text" (Landow, 1992:72). Lacking the physical concreteness of the printed text, an electronic document immediately suggests a less enduring, less definitive message. When that transient document is then electronically

located within an interactive network of other texts, one further erodes the authority of the text by establishing a multivocal discussion that draws inputs from a wide spectrum of sources. Within a normal conversation, one appropriately adopts an attitude of egalitarian give and take. No one individual dictates what will ultimately emerge from the unpredictable exchange. Proposals and perspectives are tentatively offered for review and evaluation by the participants. Ambiguities are clarified, errors are corrected, and new proposals are shared that build on previous insights.

A hypertextual network provides this same kind of interactive environment for communal collaboration. A given text is dispersed into the inclusive context of other texts. All the participants in the network have the opportunity to evaluate the meaning of the text and add clarifying links, critical comments, and differing perspectives. The meaning of the text evolves as it incorporates the collective inputs of those involved in the conversation. Any particular text is merely a starting point for the digital dialogue.

This deconstructive approach clearly weakens the unique authority of any particular document. Just as no individual should dictate the outcome of a normal conversation, no single text should be allowed to determine the emerging meaning that grows out of a hypertextual exchange. Newly empowered readers will certainly be reluctant to surrender their ability to directly challenge the texts they encounter:

> A fully implemented embodiment of a networked hypertext system such as I have described obviously creates empowered readers, ones who have more power relative to the texts they read and to the authors of these texts....This pattern of relative empowerment...appears to support the notion that the logic of information technologies, which tend toward increasing dissemination of knowledge, implies increasing democratization and decentralization of power. (Landow, 1992:169)

This dispersion of power will be hard to reverse and may well subvert the traditional hierarchical structures of many organizations. (The weakening of the hierarchical chain of command through the installation of electronic mail systems has already been documented [Kiesler and Sproull, 1992]. One would expect a full hypertext system to present an even greater challenge to conventional power structures.) If constructive hypertext becomes a dominant form of communication, those systems that do *not* offer readers the opportunity to respond to texts (or that severely restrict the nature of the response) may very well frustrate and antagonize those who are accustomed to the free exchange of ideas. A text that intends to close off conversation and determine meaning by decree will very likely engender a hostile response.

Conclusion

The deconstructionists have developed a theoretical approach to text that emphasizes the evolving meaning created by an all-inclusive intertextual conversation. The emergence of hypertext technology appears to some observers to provide the means for implementing this visionary promise. The proponents of constructive hypertext often claim it will lead to a wide range of impressive benefits. Indeed, it will free readers from the narrow, oppressive confines of the printed text and allow for a creative exchange between authors and readers (Joyce, 1988; Bolter, 1991; Barrett, 1989; Landow, 1992, 1994). Embedded power structures that depend on printed text will be dismantled and replaced by a more inclusive, less hierarchical--more democratic--distribution of power. The creation of text will become a mutually enriching collaboration among a virtually

unlimited pool of contributors. In short, the new technology offers tremendous potential for improving the quality of our lives.

Given the dangers of enthusiastic excess, one must be cautious in evaluating such claims. (To puncture the overflowing zealotry of some hypertext advocates, one researcher at a major conference entitled his paper: "Hypertext--Does it Reduce Cholesterol Too?" [Landow, 1992:7].) Clearly, one should not allow romantic attachment to the wonders of a new technology to overcome sober judgment (Johnson, 1995). It will be years before we know if the effusive "hype" about hypertext is justified by the systems that emerge (Raskin, 1987).

Caution cuts both ways, however. Hypertext might well transform our fundamental system of communicating information. It could destroy in a generation the paradigm of print that has endured for over five centuries. With the possibility of that kind of revolutionary transformation on the horizon, caution suggests that we not ignore the hypertext phenomenon or summarily dismiss its enthusiastic advocates. One can argue that we would be wise to carefully consider the implications of such a transformation.

VI. The Air Force and Hypertext, Limitations of the Present Study, and Recommendations for Future Research

The Air Force and Hypertext

Potential Negative Impact of Hypertext. The discussion developed in Chapter V suggests that hypertext will tend to empower readers and undermine the unique authority of any particular text. While the corporate respondents to the survey reported in Chapter IV unanimously recommend the transformation of Air Force publications into hypertext, they also acknowledge the revolutionary implications of such a fundamental change. If the Air Force proceeds with its plan to create hypertext versions of its operating directives, it should certainly be aware of these kind of potential effects. In fact, if hypertext becomes a pervasive method of communication, one could argue that it will have an impact on Air Force members' experience of text even if the Air Force chooses *not* to create hypertext versions of its publications. As mentioned in Chapter V, if users habitually encounter systems that offer the interactive features of constructive hypertext, that experience will undoubtedly color their perception of all texts. If texts are viewed within a culture as evanescent manifestations of emerging meaning, even those texts that strive to maintain a sense of authoritative permanence will be subject to challenge by users accustomed to empowered interaction.

If the Air Force does transform its publications into hypertext (and the momentum of the new technology would make it hard to resist), users would very likely have a direct opportunity to immediately challenge the authority of a text. An e-mail link, for example,

to the office of primary responsibility for a publication could easily be included within a hypertext document. Users with questions or criticisms could forward them within minutes to the office that wrote the document and is responsible for changing it. When the user can ask "Why?" with a click of the keyboard, one can expect that many users will take advantage of the opportunity. This process may well subtly erode the authority of the text. The reader's normal response might well evolve from "this is the way it is" to "why is it this way?" The document will be humanized and the directives will not seem to come down from Olympian heights, but from an easily accessible individual who one can challenge and disagree with in virtual real time.

Those within the military chain of command who develop and disseminate operating directives might understandably be extremely suspicious of a system that encourages users to challenge the guidance they provide. Some may consider the inescapable expectation of interaction a serious problem with hypertext systems. Not everyone can be expected to share the deconstructionists' enthusiasm for "empowered readers" and "all-inclusive input." Many observers will not be persuaded that the diminished authority of any specific text is clearly an unambiguous blessing. That is, some texts simply do not lend themselves to conversation. The nature of the textual message might be such that dialogue is not an acceptable option. One might hope, for example, that an emergency message detailing a new procedure for preventing the inadvertent launch of a nuclear missile would be received without the user insisting on the need for further discussion.

The life or death urgency of many military situations often demands unconditional acceptance and obedience. The inherent tentativeness and suggestive exploration appropriate to a civil conversation seem absurdly out of place when immediate adherence to a directive may mean the difference between survival and destruction, defeat or victory. Military leaders would be understandably uncomfortable if their orders were considered one more input in a wide-ranging discussion.

The dangers of diminished authority resulting from hypertext outlined above, however, are no doubt exaggerated. While a constructive hypertext system may allow and even encourage user interaction, it does not thereby eliminate user judgment or responsibility. In general, one would think that military members can be trusted to know when the situation demands immediate acceptance and when offering critical inputs might be more appropriate. During a crisis when lives on the line, the impact of the hypertext diminishment of authority seems likely to be negligible. Whatever impact hypertext might have, it is unlikely to result in disobedient chaos. A subtle but significant "leveling" of the chain of command has been associated with the introduction of advanced communications technology (Kiesler and Sproull, 1992). One could expect constructive hypertext systems to accelerate such tendencies, but not entirely eliminate due respect for good order and discipline.

The Benefits of Hypertext--User Involvement. While there are risks relating to the stability of the chain of command associated with the introduction of hypertext systems, one could also expect tremendous benefits that justify whatever risks are involved. One of the key ingredients of the Total Quality Management approach (which

is the basis for the Quality Air Force Program) is an emphasis on employee empowerment (Ivancevich et al, 1994). Studies that support this progressive management philosophy indicate that when employees are not simply told what to do, but are given a real opportunity to make inputs into policy and procedures, productivity and morale dramatically increase (Ivancevich et al, 1994:300). Constructive hypertext systems provide an effective avenue for soliciting input from employees at every level of an organization.

If Air Force members are allowed and encouraged to challenge and suggest changes to operating directives, they are thereby directly empowered to become involved in the evolutionary development of these texts. The text will become "more permeable" and less stable. This might to a certain extent undermine the unquestioned authority of the publication, but it will also lead to more authentic acceptance of the emerging product because users at all levels will have a voice in the text's creation. With this approach, directives will not be handed down from above, but will progressively unfold in an interactive feedback loop from the end user to higher levels of management. The role of user will change from passive recipient of unchallengeable dogma to active participant in the creation of new meaning. The text may manifest an unstable fluidity, but it will also reflect the insights of an organization-wide conversation. From this continuing process one could expect operating instructions that speak more clearly to the real mission of the end users.

The Benefits of Hypertext--Organizational Permeability. By breaking down the boundaries separating military documents from one another, hypertext also has the

potential to lower the barriers that separate organizational levels, different career fields, and even the various military services. Textual permeability, in other words, can lead to organizational permeability. Hypertext can provide an instantaneous electronic connection between organizational domains that are currently considered widely separate. By connecting countless databases together, hypertext can offer the end user the proverbial "Big Picture" in a way that could never be imagined before. It can establish an electronic framework that provides cross communication and feedback from throughout the military environment--and beyond.

With a database linked to a wide range of other databases, users can reach outside their parochial focus on their own specific information needs and gain an appreciation for the information needs of users everywhere. They can conveniently compare procedures and evaluate their processes in light of information gathered from throughout the military environment. For example, if individuals in an Air Force unit personnel office had a direct link to the Army's procedures for inprocessing new troops, they would be able to immediately access the effectiveness of their procedures against a benchmark organization.

Military units are, in many ways, defined by their regulatory guidance. The electronic connections made possible by hypertext will locate those self-definitions in the midst of an widely-inclusive conversation. The regulatory guidance will be subject to questions, criticisms, challenges. The texts will become permeable to the inputs of outside observers. The collapse of the walls that isolate these regulatory self-definitions will also, no doubt, undermine the boundaries that separate the owning organizations as

well. Hypertext, therefore, will promote the increasing integration of organizational structures and knowledge. It will foster a corporate-wide perspective that discourages any military unit from placing proprietary restrictions on its databases. As it becomes more difficult to separate one text from another, it will also become more of a challenge to sharply distinguish one unit from another. The proliferation of electronic interconnections will blur the edges of the wiring diagrams and enhance information sharing throughout the Air Force.

Conclusion. Disseminating the Air Force's publications through a hypertext system is not without risk. It will threaten the stability of the chain of command and undermine the authority of any particular text. There may even be those who are convinced hypertext will lead to anarchy. Fear in the face of such a dramatic transformation is certainly understandable. Leadership, however, often requires the bold acceptance of risk. Those who would restrict the interconnections or limit user input in the Air Force's on-line publication system should heed Ted Nelson's poetic warning:

> Remember the analogy between text and water. Water flows freely, ice does not. The free-flowing, live documents on the network are subject to constant new use and linkage, and those new links continually become interactively available. Any detached copy someone keeps is frozen and dead, lacking access to the new linkage. (Quoted in Landow, 1992:59)

The Air Force will become a more dynamic, creative organization if it implements a system that will encourage users at every level to participate in the evolutionary development of textual meaning. The on-going hypertextual conversation offers the best hope for integrating organizational databases, providing users a broad corporate

perspective, and empowering members with a voice in the policies and procedures that guide their duties. The Air Force would be wise to proceed with a hypertext publications system without delay.

Limitations and Recommendations

The present study offers a high level, philosophical analysis of hypertext and includes a survey designed to gather the assessment of experienced users concerning the revolutionary implications of hypertext systems. There has been no effort to focus in on the countless technical questions that should be examined as hypertext evolves over the next few years. Specific comparisons, for example, of various software packages will have to be conducted to determine the most appropriate features to include in a hypertext system. Which interface do users find most convenient? How disorienting is the process of navigating through the system? Which method of creating links and providing inputs is most effective? These are issues that are starting to be explored and which will be the basis for various studies in the coming years (Haas, 1996). As hypertext becomes a more pervasive form of communication, these empirically-based studies will become more common and useful.

Time limitations restricted the survey results to a cross-sectional snapshot of the companies involved. A long-term longitudinal study would provide a more detailed picture of the changes that occur when a company uses hypertext for an extended period. Also, the survey sample was limited to very large corporations. With a wider sample that included smaller companies, one could have greater confidence that the results accurately represented the corporate assessment of hypertext.

In addition to the numerous empirical studies that will undoubtedly explore the technical subtleties of hypertext systems, there is also a continuing need to address the profound theoretical implications of such a radical transformation of our cultural technology of communication. The new logic of hypertext will provide a fruitful source of philosophical discourse well into the twenty-first century.

Appendix A: Hypertext Survey

The Air Force is migrating from paper to electronic publishing of all its internal governing directives and operating manuals. Eventually, the plan is to develop extensive hypertext links between related documents for easy access and retrieval of information. Your company is a leader in the use of modern technology, and this survey is an effort to learn from your experience how the Air Force might best exploit the unique capabilities of hypertext. By detailing the benefits of hypertext (if applicable) and the problems associated with it (if applicable), you will help the Air Force make a smoother and more mission-effective transition to the world of electronic documents. If you have any questions, please contact me at ggeison@afit.af.mil. Your assistance is greatly appreciated.

-

Name: _____ Duty Title: _____

Organization Name: _____

Address: _____

Phone Number: _____ E-Mail Address: _____

Please answer the following questions by marking ALL the boxes that apply:

1. What is the primary activity of your organization?

☐ Business/industry	☐ Computing	☐ Government	☐ Education
☐ Research	☐ Publishing	☐ Communications	☐ Services
☐ Public Admin	☐ Manufacturing	☐ Retail	☐ Wholesale
☐ Other (please specify)			

_____

_____

2. How many employees are in your organization?

☐ 0 to 500 ☐ 501 to 1,000 ☐ 1,001 to 5,000 ☐ 5001 to 10,000
☐ More than 10,000

3. Does your company use hypertext (documents with automatic links to related documents) for internal or external distribution of information?

☐ Yes ☐ No

(If your answer is no, then you have completed the survey and may return it now. If your answer is yes, please continue with the next question.)

4. For what types of documents does your company use hypertext?

☐ Letters/Memos ☐ Books/Publishing ☐ Electronic Database
☐ User Manuals ☐ Regulations/Publications ☐ Technical Manuals
☐ Request for Proposals ☐ World Wide Web Site
☐ Other
(Please specify)
_____

5. How long has your company used hypertext for distributing information ?

☐ Less than 1 year ☐ 1 to 2 years ☐ 2 to 3 years ☐ 3 to 5 years
☐ 5 to 7 years ☐ More than 7 years

6. Why did your company initially choose to use hypertext?

☐ Required by upper management ☐ Required to meet demands of customers
☐ Compliance to a standard or contractual agreement ☐ Competition
☐ Change in information technology
☐ Anticipated improved accessibility and effectiveness of information
☐ Other
(Please specify) _____
_____

7. How many hypertext documents does your company create per year?

☐ None ☐ 1 to 10 ☐ 11 to 24 ☐ 25 or more

8. A company can transform existing paper documents into hypertext by adding links, or it can create entirely new documents specifically designed for hypertext. In creating hypertext documents within your company, what percentage would you estimate fit into one of these two categories ?

___% Percent of hypertext documents newly created specifically for hypertext

___% Percent of hypertext documents that simply transform existing paper documents into hypertext by digitizing them and adding links

9. Does your organization provide training on hypertext creation and use to its employees?

☐ Yes. Do you feel this training has enhanced the effectiveness of hypertext?
☐ Yes ☐ No

☐ No. Do you believe training would be beneficial? ☐ Yes ☐ No

10. What resources has your company used to learn about hypertext?

☐ Practice/Experience ☐ Books ☐ Newsletters ☐ Training/Seminars
☐ Co-workers ☐ Internet
☐ Other
(Please specify)
_____

11. Do most of the companies you work with (and/or compete against) use hypertext?

☐ Yes ☐ No

12. Has your organization conducted a cost/benefit analysis of hypertext documents?

☐ Yes ☐ No

If yes, what were the results:

_____
_____

13. How would you rate the impact hypertext has had on the way your company's employees create and use documents?

Please type in a number between 1 and 10 : _____ (The scale is listed below.)

	1	2	3	4	5	6	7	8	9	10
Scale:	No impact				Some impact				Great Impact	

Can you explain what criteria your company uses to measure "impact"?

_____

Can you provide examples of the impact hypertext has had?

_____

_____

14. How would you rate the effectiveness of hypertext in improving the distribution of information in your organization?

Please type in a number between 1 and 10 : ____ (The scale is listed below.)

	1	2	3	4	5	6	7	8	9	10
Scale:	Not effective			Somewhat effective				Very effective		

Can you explain what criteria your company uses to measure "effectiveness"?

_____

_____

15. Based on your company's experience, do you think hypertext represents a revolutionary shift in the way information will be disseminated in the future--comparable to the invention of the printing press?

Please type in a number between 1 and 10 : ____
(The scale is listed below.)

	1	2	3	4	5	6	7	8	9	10
Scale:	Not revolutionary			Somewhat revolutionary				Completely revolutionary		

16. Has your organization discovered that the effective use of hypertext requires a new way of thinking, a "new logic"?

Please type in a number between 1 and 10 : ____
(The scale is listed below.)

	1	2	3	4	5	6	7	8	9	10
Scale:	Absolutely not			Perhaps				Most definitely		

If there is a new logic, how would you describe it?

_____

_____

_____

17. What would you suggest are the main benefits of hypertext?

_____
_____
_____

18. What would you suggest are the main problems with hypertext?

_____
_____
_____

19. Based on your company's experience, would you recommend that the Air Force pursue its plan to transfer its governing directives to hypertext?

☐ Yes ☐ No

Why or why not?

_____
_____
_____

20. I may wish to contact you for further information regarding this questionnaire or hypertext. May I call you?

☐ Yes ☐ No

Is there is any additional information you would like to provide? Please share any insights you feel might be helpful to the Air Force as it migrates from a paper-based publications system to a hypertext environment.

_____
_____
_____
_____
_____

Thank you for your participation. Please return the completed questionnaire in the enclosed envelope or to the following address:

Gordon G. Geison, Major, USAF
5200 Access Road
Dayton, OH 45431

Internet: ggeison@afit.af.mil
Fax: 513-476-7988
Phone: 513-253-0549

Appendix B: Comments From Hypertext Survey

Questions 16,17, and 18, and 19, and 20 of the hypertext survey reproduced in Appendix A solicited comments from the respondents. This appendix collects the comments the respondents provided.

Question 16. If there is a new logic [required in hypertext], how would you describe it?

Respondent A: It is a cultural change. Viewing information on-line versus on paper is a big step.

Respondent B: Being more aware of who will be reading the information in terms of content and security. You have to consider how to break up the information into chunks, and then decide the best way to help readers get the information they want.

Respondent D: Paper is not like electronic--the main problem is that screens are limited in their display size.

Respondent E: Information is pulled more often than pushed. Information is not simply pushed on calendar dates, rather it is kept current by a content owner. We don't provide hard copies just in case someone needs it; rather they get it on demand.

Respondent G: Visual presentation is more important when using hypertext. It is viewed as a picture more than writing.

Respondent I: There probably is a new logic; we just don't have enough experience to know yet.

Respondent K: Hypertext is nonlinear.

Respondent L: You need to give up linear thinking and writing. It is no longer necessary to reiterate things that have been stated previously since you are able to link to the previous documents.

Respondent M: Minor change.

Respondent N: Obviously hypertext is nonlinear so you have to be able to plot out a story line that way. Also, hypertext requires links to related information--plotting out how all the links will be organized so that they're easy to follow is a challenge.

Respondent P: Hypertext requires you to think beyond the stand alone document and to manage all the documents/links within a given chain.

Respondent Q: You can no longer think in sequential fashion. You have to be able to think in "layers" of what people need--what is most important first, what is of next importance, etc.

Question 17. What would you suggest are the main benefits of hypertext?

Respondent A: Getting people on to the electronic media. It's easier to distribute and access to information should be faster. Documents can be kept short and related topics can be linked together.

Respondent B: Reduces the use of paper; allows information to be presented to a larger number of people; HTML is easy to learn; and updates to an HTML document are available immediately. Relatively inexpensive to get an intranet set up and convert key documents to hypertext.

Respondent C: Cross references; pointers to other information.

Respondent D: Ease of distribution of information to many people with a relatively easy user interface.

Respondent E: Quickly locating targeted detailed information. Communicating key messages.

Respondent F: Code reuse; economical; easy to use.

Respondent G: Versatility of presentation, e.g., stylized text to create a mood, make a statement, or appeal to a particular audience.

Respondent H: The information is a lot more accessible by everyone. You don't have to worry about "where's the manual?" The information can be presented in a more appealing manner.

Respondent I: Speed at getting to needed information; efficiency of sharing information; promotes sharing of information.

Respondent J: Access information quicker.

Respondent K: More encompassing, better reference, more detail available.

Respondent L: The ability to bring an idea thread full circle even across documents and time.

Respondent M: Ease of use and links to other related information.

Respondent N: You can keep any text on any given page short, yet provide a depth of total information if the reader wants it.

Respondent O: Self-directed discovery yields better retention. Serendipitous "finds" that would not occur with a more directed search.

Respondent P: Ease of publishing and general global commercialization of products to produce and verify documents.

Respondent Q: Interactivity keeps people involved with the process and the information you are attempting top impart. If the links are interesting enough, you can keep their attention for hours.

Question 18. What would you suggest are the main problems with hypertext?

Respondent A: Keeping the links between documents up-to-date. Getting people to use hypertext links. When you need a printed copy it is hard to produce.

Respondent B: HTML is limited in what it can do right now. It is only a way to structure information, not a page-layout mechanism. I haven't found any HTML editions that I like, so Notepad is still my tool of choice. We're hoping future versions of HTML will do more desk top-publishing tasks.

Respondent C: Proliferation of pointers, poor management and control. Hard to print sections desired.

Respondent D: Management of the links and content.

Respondent E: Managing links, maintaining consistent style, determining and evaluating access paths, coordinating information.

Respondent F: Some learning curve.

Respondent G: Presenting it in a way that is clear and meaningful within the constraints of the medium.

Respondent H: Trying to convert COBOL programmers to HTML programmers.

Respondent I: The reader can be easily sidetracked from the main message.

Respondent J: It's a new paradigm, a change.

Respondent K: Links can be overused within a document.

Respondent L: The need to not think linearly and having to code by hand.

Respondent M: Learning how to implement it effectively.

Respondent N: Organizing it so that it's easy to find what you need.

Respondent P: Need to make sure all links and files are up to date and that files (content) is not duplicated (version control problems).

Respondent Q: You have to be much more creative in the way you lay out your documents to keep people interested and hopping about. It's very easy to lose your track and forget to add a critical link or a critical piece of information. Many print writers/production people don't tend to be as "MTV" generation as you need to be to create lively, entertaining, linkable documents because they are used to dealing with a flat medium. Designers and video people tend to be more creative, but may lack the organizational understanding and thus get so enthralled with the technology and gadgetry that they forget to impart information useful to the user.

Question 19. Based on your company's experience, why would you recommend the Air Force pursue its plan to transfer its governing directives to hypertext?

Respondent A: Information is an important part of every company. It needs to be accurate, complete, easily accessible, and available where it is needed. Hypertext helps meet those goals.

Respondent B: It's a cost effective way of getting information to a large number of people. It's relatively easy to convert and maintain existing documents in HTML.

Respondent C: If it's a large body of knowledge it would benefit from extensive links.

Respondent D: To make the information more accessible to your users.

Respondent E: An on-line system saves money, provides better information to the users, and eliminates redundant information.

Respondent F: Economical way to publish information to a large audience. It is also relatively simple to do and a very efficient way to manage information.

Respondent I: In any large organization access to information can be tremendously difficult. If the intent is the communication model of the future--which I think it is--use of hypertext is a requirement for survival.

Respondent J: Hypertext will provide added value over time.

Respondent L: The largest problem with corporate communications seems to be version control of information. Everyone has a copy of important directives, but it is near impossible to make sure that everyone had the proper version of that directive. Hypertext allows you to maintain just one copy of directives while giving unlimited access to it.

Respondent M: Facilitate timely access and currency and related references.

Respondent O: Makes access to information easier, quicker, cheaper, more ecologically friendly, and more fun.

Respondent P: Links to supply chain are enhanced (everyone is doing it, you're more effective if you join in).

Question 20. Is there any other information you would like to provide?

Respondent A: Going from paper to an on-line environment requires a change in philosophy. You are going from a "push" information model to a "pull" model. Make sure your organization is aware of this. It will take time for it to be accepted. The best way to get it accepted is to get your executives excited about it and using it. If that happens, everyone else should follow along because people will gravitate to where the information is. Pick one application your executives need and start with that. Another thing is once you've got the information on-line, your technological infrastructure must be able to handle it. Response time must be good.

Respondent B: The most frustrating thing about using the Internet for many people is the that they feel lost once they start jumping around in a document. They don't know where they are within the document or how they got there. It will be helpful to the users (and you, too) if you will do: 1) an audience analysis; 2) develop a template to use for your HTML documents; 3) use the story board method to chunk your information and plan the number of jumps needed to get to it; 4) develop a clear method of navigation and stick with it throughout the document.

Respondent G: We are in the early stages of implementing an intranet. I don't think we will experience the full advantages of hypertext until it is operational.

Respondent P: Hypertext documents are a step towards standardization of electronic published information that can be organized, viewed and searched across multiple architectures on a global basis.

Respondent Q The best recommendation I can give is to KISS it.--keep it simple stupid. Less is best, especially when it comes to words on a computer screen. The more graphics you can use to tell the story, the better off you are.

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Vita

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[redacted]

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 074-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	December 1996	Master's Thesis

4. TITLE AND SUBTITLE
THE NEW LOGIC OF HYPERTEXT: ELECTRONIC DOCUMENTS, LITERARY THEORY, AND AIR FORCE PUBLICATIONS

5. FUNDING NUMBERS

6. AUTHOR(S)
Gordon G. Geison, Major, USAF

7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(S)
Air Force Institute of Technology
2750 P Street
WPAFB OH 45433-7765

8. PERFORMING ORGANIZATION REPORT NUMBER
AFIT/GIR/LAC/96D-2

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Lt Col A. Sgroi, HQ ACC/IMP
230 E. Flightline Rd
Langley AFB, VA 23665-2781

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for release; distribution unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT (*Maximum 200 Words*)

Hypertext systems offer electronic links that can instantly join related documents with the click of a mouse. Many predict that soon hypertext will be the predominate technology of communication. This revolutionary transformation of our culture's basic system for sharing information will have profound impact. No empirical study can yet capture the long-term implications of this new technology. An exploratory survey, however, was distributed to 100 corporations to gather their assessment of the revolutionary implications of hypertext. The results suggest that hypertext will lead to dramatic changes in users' experience of text. This thesis examines the potential consequences of moving from print to a hypertext environment in light of the literary theory known as "deconstructionism." This philosophical approach to the interpretation of text emphasizes the breakdown of the boundaries that seem to separate documents from one another. The illusion of isolated, self-contained, authoritative meaning gives way to an all-inclusive intertextual conversation. Hypertext provides the physical connections necessary to implement the interactive dialogue central to the deconstructionists' vision.. The Air Force is developing a plan to disseminate its operating directives on-line in a system with hypertext features. This study concludes that the Air Force should implement this plan without delay.

14. SUBJECT TERMS	15. NUMBER OF PAGES
Hypertext, Internet, Philosophy, Information Transfer, Military Publications, Man Computer Interface, Literary Theory, Deconstructionism	95
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED

AFIT Control Number AFIT/GIR/LAR/96D-2

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