PROPOSAL ACCEPTANCE FORM

Name of Student Patricia A. Antrim

[redacted] ____________________

Title of Dissertation GILS, the Government Information Locator Service: Observing the Development of a New Government Information Service

Signatures:

Robert Grover
Dean of the School of Library and Information Management

Timothy M. Downs
Dean of the School of Graduate Studies and Research

Herbert K. Achleitner
Committee Member (Chair)

Martha L. Hale
Committee Member

Evandro Camara
Committee Member

Jack O'Gorman
Committee Member

Patricia A. Antrim
Doctoral Candidate

AN ABSTRACT OF THE DISSERTATION
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Title: GILS, the Government Information Locator Service: Observing the Development of a New Government Information Service

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How government developed the Government Information Locator Service (GILS) is the focus of this dissertation. It is a qualitative analysis based on the social systems theory of Niklas Luhmann (1982, 1990b, and 1995). Data were analyzed by means of second-order observing of the communications of the political system which is itself differentiated into the sub-systems of politics, administration, and the public. Findings reveal that GILS was a successfully completed task or project for government; at the same time it was an opportunity for profit in the economic system and a problematic information finding aid for library science. GILS is an electronic index which is based on an international voluntary standard for information search and retrieval, Z39.50, also known as ISO 23950. The purpose of GILS was to make government information public, a fundamental operation of democratic government. It was designed during a time of rapid technological change and intended to function like a library's card catalog to help the public and government agency personnel locate government information via the Internet. Included are chronologies tracing the history of the predecessor to GILS, the Federal Information Locator System (FILS), and the events that contributed to the final GILS product. The data analyzed were communications of the political system. For politics these communications are of persons and party programs and were found especially in congressional debates and hearings. For the administrative sub-system, the communications function as binding decisions. Communications analyzed included the Paperwork Reduction Acts of 1980 and 1995 and other legislation; information policy and

guidance documents like OMB Circular No. A-130 and FIPS 192 and 192-1; vision documents like Eliot Christian's 1994 "The Government Information Locator Service: Report to the Information Infrastructure Task Force;" and standards like the GILS Applications Profile). The communications of the public function as statements of public opinion. These were found in congressional hearings, newspaper and journal articles, research reports, and an archived collection of electronic mail communications sent to a discussion list established for the development of the GILS Application Profile, the GILS Forum.

GILS, THE GOVERNMENT INFORMATION LOCATOR SERVICE: OBSERVING THE DEVELOPMENT OF A NEW GOVERNMENT INFORMATION SERVICE

by

Patricia A. Antrim

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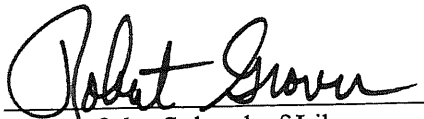

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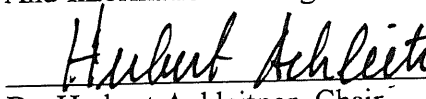

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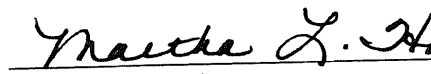
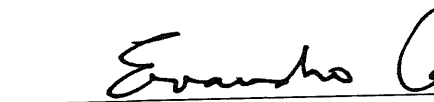


Dr. Martha Hale



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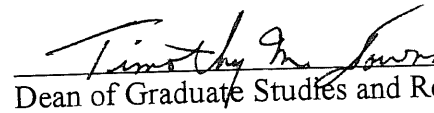

Dean of Graduate Studies and Research

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CHAPTER 1
INTRODUCTION

A necessary characteristic of democratic governance is the practice of making government work visible to the citizens of the nation (Brown, 1996). James Madison wrote W.T. Barry on August 4, 1822, about the necessity of the public to know what its government was doing: "A popular Government without popular information, or the means of acquiring it, is but a Prologue to a Farce or a Tragedy; or perhaps both. Knowledge will forever govern ignorance; And a people who mean to be their own Governors, must arm themselves with the power which knowledge gives" (Hunt, p. 103).

But how does the public locate information about their government? Very early in the history of the United States, the government identified a need for more long-term and wide-spread access to the documents produced by the government. These included the day-to-day debates of legislators who were dependent on public opinion for their re-election and reports like the decennial censuses that both described the nation and determined the boundaries for Congressional voting districts. Responding to this need, the government has provided a variety of services over the years to make the work of government visible to the public. These have included opening Congressional proceedings to newspaper reporters, establishing depository libraries for preserving records of their proceedings, funding post roads over which newspapers and government documents were carried to remote communities (Ritchie, 1991), and even promoting access to a nationwide network of telecommunications.

The government has made additional provisions for assisting the public to locate government information resources in the form of various kinds of indexes and

bibliographies. Various government agencies have produced periodic bibliographies of their own publications and, in 1895, the U.S. Government Printing Office was charged to produce a monthly government-wide index of Federal government publications: the *Monthly Catalog of Government Publications*. When USMARC cataloging was developed by the Library of Congress, the Government Printing Office began to use this standard for describing government publications in the *Monthly Catalog* and for creating electronic cataloging records for databases such as the FirstSearch GPO database and other vendor-developed cataloging services. These resources have been used by both the government and the public to identify information resources produced by the government. They are well-respected finding tools in many depository libraries.

When the Internet became available to more than a select few universities engaged in defense contracting work, government agencies began to make information products available there. As was the case with earlier government information products, government also produced indexes for the information provided via the Internet.

In the mid-1990s the government added online collections of agency-produced records describing government information resources. This service, the Government Information Locator Service (GILS), is a collection of records that identify, describe, and indicate where users may locate sources of government information. Office of Management and Budget (OMB) Bulletin 95-01 describes GILS as follows:

> GILS will consist of decentralized agency-based information locator records and associated information services. It will use off-the-shelf communications and information technology products and services so that government information can be stored and retrieved in a variety of ways and in a variety of locations (1994).

Although the locator records are available via the Internet, the scope of their coverage is not limited to Internet-based information resources. GILS records describe individual electronic publications, databases, library collections, and contact personnel.

This dissertation describes the development of the Government Information Locator Service as a system of communications. The theoretical guidance for this dissertation is the systems theory of Niklas Luhmann (1995), in particular his theoretical description of the political system (1982, 1989, 1990a, and 1990b).

Statement of the Problem

GILS was developed in a time of rapid change. Although the Internet as a network had been in use for several decades by a select few researchers and technical experts, it was only just beginning to be used by a general (although technically-sophisticated) public audience when work began on the development of GILS. In the early 1990s it was an information space that provided text documents; there were no hyperlinks, no graphics, no sound, no chat, and no interactive business web sites.

Few guides to information (indexes) existed then for using the Internet. Scott Yanoff produced an electronic newsletter that described various repositories of information and how to access them. His lists included many information resources produced by Federal government agencies. Mitch Kapor's *Big Dummy's Guide to the Internet* also provided a sense of how difficult it was to find things on the Internet in the early 1990s. Browser software like Netscape and Internet Explorer would not appear for years to come.

How government used computer technology changed dramatically through the 1980s (Moore, 1990). Agencies discarded manual procedures for processing information

for newly-developed computer-based processes. Not only was technology changing rapidly, information policy was also changing in profound ways throughout the 1980s and early 1990s (Hernon, 1989). According to Hernon, the Reagan Administration introduced a management strategy that emphasized the cost of government information products far more than the benefit of those products and questioned the assumption that the government had a responsibility to provide its publications free of charge to the public. In 1990, Congress criticized the Reagan administration's "war on waste" and the resulting reduction of government information available to the public. In legislation intended to reauthorize the Paperwork Reduction Act of 1980, Congress recommended a comprehensive computer-based indexing system that the public could use to locate government information (S. Rept. No. 101-487).

Hernon and Relyea (1995) cite changing interpretations of what constitutes a government publication. In 1982, the general counsel to the Government Printing Office offered an interpretation of the congressional definition for a government publication as including paper and microfiche resources. By 1990, however, GPO's counsel reversed that decision. The Office of Management and Budget (OMB) had sought since 1989 new and creative ways to address the rapidly changing information environment (testimony of S. Jay Plager, *Reauthorization of the Paperwork Reduction Act,* 101st Congress, 1st Sess, 1989). A few years later OMB described the 1990s as "an era of technological upheaval–the information age" (1995, p. 20,127). They invited members of the public from across the nation to participate in a two-week long electronic public meeting designed to generate new ideas about how government in the information age might work for Americans.

Christian and Gauslin (1992) described ubiquitous desktop workstations, massive supercomputers, a rapidly growing Internet, and rapidly growing collections of information. What was really needed were search techniques that were both quick and affordable. Kenneth Allen of the Information Industry Association described the situation as follows (Federal Information Dissemination Policies and Practices, 101st Congress, 1st Sess., 1989):

> What is new is the complexity and the importance that [issues associated with access to government information] take on with the advent of new information technologies which permit us to fundamentally reshape the ways in which we create, use and disseminate information. Yesterday's rules will not apply to today's problems.

In other testimony (*Reauthorization of the Paperwork Reduction Act,* 1989), he stated that

> The issues are certainly not new, they go back more than 200 years. What is new, however, is the impact of the new technologies, the computer and telecommunications networks that are changing the way in which we use, deliver and create information. These technologies are changing the way in which government operates, and the relationship between government and its citizens. What is not new are the resource constraints which limit what government can do. It forces policy officials to make difficult choices. . . . The issues are evolving very rapidly and the impact of technology continues to be felt (p. 589).

The old rules no longer worked. Government publications were not only ink on paper products but were also electrons accessible via the Internet. How does the public locate the information they need? How does a government agency provide publicly-available pointers to that information? The standard solution was to produce an index of some kind. For paper documents, published indexes distributed on paper were standard. For information resources on the Internet then, the index–according to standard practice–should also be available on the Internet. How was the government to design an

electronic index or locator when technology was so rapidly changing? How government accomplished this task is the focus of this dissertation.

Theoretical Structure and Methodology

This dissertation is a qualitative study informed by Niklas Luhmann's social systems theory (Luhmann, 1995). His theory employs distinctions as it observes the communications of various social systems using an integrated network of theories and exploring system communications with sensitivity for the meanings of those communications as developed by the system itself.

Using Luhmann's theory allows the observer to employ the strategies of the system being observed to observe that system and to juxtapose those systems' structures against those of other systems (1998). Not only did Luhmann theorize about social systems in general (1995), he also described the function of the political system in particular (1982, 1989, 1990a, and 1990b). Therefore, his theory provides both general and specific theoretical guidance for observing the development of GILS.

Luhmann assumed that there are social systems and that they are composed of communications (1995). Each system distinguishes itself from its environment and from other social systems by the particular character of its communications. The political system functions by means of distinctions such as conservative/progressive, in government/out of government, government/opposition, in office/out of office, and it functions by means of binding decisions[1] which those in government establish (1989).

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[1] "A decision is binding whenever, and for whatever reasons it succeeds in effectively restructuring the expectations of those affected and thus becomes the premise for their future behavior" (Luhmann, 1982, p. 145).

The political system is composed of three sub-systems: politics, the administrative and the public. Politics (personalities and political parties) determines boundaries and priorities for administrative decisions. The administrative sub-system (which includes legislative work) develops binding decisions that constrain both government itself and the public. The public (within the political system) reacts to these binding decisions through expressions (letters to newspapers and congressmen, telephone calls, opinion poles, and similar strategies) and, of course, elections (Luhmann, 1990b, p. 47-48).

Each of these sub-systems contributed communications that shaped the development of GILS. Some of these communications were referenced frequently. These became, in theoretical terms, communications that organized other communications around themselves. For example, a 1994 document written by Eliot Christian described the characteristics of the yet-undeveloped information system that would become GILS. That document was frequently used to settle disagreements about what capabilities were needed in the standard being written by those who developed GILS. As such, communications ordered themselves around this 1994 communication. It functioned to settle arguments and automate decision-making. As a decision-making schema, it functioned as a systemically structural communication cited again and again. The other communications that contributed to creating GILS formed a dense hub of meaning-bearing communications around this structural communication, and it is by means of communications like this one that GILS emerged with the characteristics it expresses.

This dissertation provides a theoretically-driven description (by means of meaning-producing distinctions) of a description of the development of GILS, how the structures within government shaped it through its pre-history, legislative mandate, and its technological environment. It includes a description of the development of the computerized index that preceded GILS, the Federal Information Locator System. This system, mandated an earlier version of the law that required GILS, had a different structure and purpose from GILS, and it was developed in a very different way. Because it affected the development of GILS, it is included.

Given the theoretical assumptions of this dissertation (that there are systems, that they function by means of communication, and all that follows from that), data selection and analysis proceeded in a way that was sensitive to those assumptions. The data was communications of those participating in the development of GILS. These communications include legislative resources like Congressional hearings and debates, Federal laws, Executive branch guidance, and an electronic mail discussion list, the GILS Forum. The archive of this list preserves the communications of those who participated in the development of standards and services that shaped GILS.

Scope of the Research

The boundaries of this research are the communications of the political system from which emerged the Government Information Locator Service. Although GILS has been used by governments at the local and state level and by governments and other entities around the world, this dissertation only describes the GILS of the United States Federal government. This dissertation is not an assessment of GILS; rather, it is a systems theoretical description of the endeavor–the decisions, the operating procedures,

the communicating strategies[2]–used by government to create GILS. As described above, the theoretical structure for this research will be that of Niklas Luhmann's social systems theory (1995). Bringing social systemic concepts to the description of GILS will make visible the elements, structures, and processes in the operation of government that shaped GILS.

This dissertation, however, will not answer every question one might ask about GILS. It is not a point-in-time description of GILS, or a judgment of how GILS should function; rather it is a description of an evolutionary process that emerged in the communications of the political system. Nor does it discover what strategies work better or worse, more efficiently or effectively, or how government *ought* to work as these require a knowledge of the end of things or at the least a transcendental perspective, neither of which is available using Luhmann's theory. It is an endeavor intended to bring precision to the description of the complex relationships at work in the political system as it manages new technologies and new services. This is not, however, a universal statement of truth about developing *any* new services; its focus is on a particular *government* service.

That GILS itself has not yet proven to be a particularly popular way for the public to locate information need not be considered in relation to its viability as a topic for observing government operations. It functions for the purposes of this dissertation as a kind of exemplar of how government functioned in this case because it grows from processes which were in place, involves typical procedures for government to accomplish

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[2]Theoretically speaking, these are the binding decisions, the structures, and the elements of the political system.

its work (legislation and a variety of developmental operations) and it has the added significance of being an early government endeavor that used the Internet both for where it was developed and where the service operates.

Research Questions

The following questions will be the focus of this dissertation:

Q1. How did the political system produce the systemically meaningful communications that constrained and facilitated the development of GILS (that is, that made government productive according to its own meaning)?

Q2. How does the political system manage the perturbations of new technology in its environment?

Q3. How did multiple causes motivate a problematic effect?

Q4. How does the political system create an information locator service for use by the public, composed of unknown and unknowable individual users?

Question 1 allows for the exploration of the strategies government used as it made decisions about GILS. How did personality and party affect legislative decisions? How did systemic structures and binding decisions function to exclude alternative strategies? How did political communications in the past constrain the interpretation and implementation of GILS? How did the political public affect these activities? The political system develops its own meaning for the concept of productivity. How did the political system understand its productivity in relation to GILS?

Question 2 brings attention to the characteristics of change. During times of rapid technological change, possibilities multiply for systems; according to its own communications, the environment of the political system expressed increased complexity. The development of GILS spans several years when government was affected by an increasingly complex information technology environment. How did government manage this complexity?

Question 3 references the critical assessments of GILS. Some assessments determined that GILS was a success; others, that GILS failed to achieve its objectives. These varying assessments suggest the possibility of a problematic effect.

GILS, by its legislative mandate of helping "the public" locate needed information, shares characteristics normally associated with library systems. GILS, however, was developed by government, not by librarians. Question 4 concerns how GILS (developed within the political system for "the public" who may be communicating within the political system, but may also be communicating in the economic, educational, family, or some other social system) differs from a library catalog (developed within information science). Confronting GILS with the assumptions librarianship makes about online catalogs and their users will reveal how GILS differs from locator services developed by libraries. It also offers the opportunity to make visible the rules and routines by which the political system created GILS, thus increasing to a higher degree the transparency available at the boundaries of the political system and of librarianship.

Organization of this Dissertation

Chapter 2 functions as part of the literature review for this dissertation. It contains a description of GILS, a review of the assessments of GILS, and a description of the resources that have become the data of this dissertation. Chapter 3 reviews the theory that has driven this research, the work of Niklas Luhmann and the theoretical work of others of particular importance to the development of a theoretical understanding of the development of GILS. Chapter 4 describes the methodology employed for this dissertation, the research design, and the data collection and analysis processes. Chapter 5 presents the results of this research, and Chapter 6 presents the research questions again along with answers that have emerged from the analysis of communications described in Chapter 5. Chapter 6 also includes description of the significance of this dissertation and a discussion of the application of Luhmann's systems theory within the discipline of library science. Appendix A contains a glossary of Luhmann terms and Appendix B, a reprint of the 1994 GILS document that structured the project (Christian). This document has been minimally reformatted for inclusion in this dissertation. It includes a list of GILS record elements (pages B22-28) and a glossary of GILS terms (pages B29-32). Appendix C reprints the text of the law that established the Government Information Locator Service, 44 U.S.C. 3511. Appendix D includes three representative GILS records, and Appendix E reprints the text of an email message discussed in chapter 5.

Summary

The objective of this dissertation is to observe and describe the development of an information service, the Government Information Locator Service. The product that emerged provides a detailed systems theoretical description of how the locator service

emerged amidst the communications of the three sub-systems of the Luhmannian political system, politics, administration, and the public. This dissertation includes a general description of Luhmann's social systems theory and a more specific description of the political system. It includes a description of the methodology used for analyzing the communications that contributed to the development of the Government Information Locator Service.

Also included are detailed chronologies of the communications that contributed to the development of the locator system, including laws, guidance documents, standards, and various other communications that functioned to constrain and facilitate the development of the locator service. These are followed by descriptions of observations of those communications informed by the characteristics of the various Luhmannian political sub-systems.

CHAPTER 2
REVIEW OF THE LITERATURE RELATED TO COMMUNICATIONS ABOUT GILS

Chapter 1 provided a general introduction to this dissertation. It included an introduction to the problem that confronted the Federal government in relation to how it made its information resources available via the Internet: how to provide a index for the public to use to locate that information. This chapter includes a general and more particular description of one of the earliest solutions developed by the Federal government, the Government Information Locator Service (GILS). It also reviews the various assessments of this service and provides a description of the communications that contributed to the development of the service. These communications are the data used in this dissertation for the theoretically-driven observation. The theory used to guide this research, the systems theory of Niklas Luhmann, is more fully described in chapters 3 and 4, although it is briefly referenced here in relation to other theoretical works. A selection of communications contributing to the development of GILS will be more fully described in chapter 5.

GILS is a good candidate for a Luhmannian study because the communications which shaped it are varied, extensive, and available, having been disseminated via the Internet. These communications include legislation, congressional debates, hearings, reports, and other documents; official memoranda, bulletins, guidelines, and other guidance documents; and the less formal communications of individuals who worked together to develop and implement GILS (as preserved in an email archive). Moreover, GILS itself is a service available on the Internet.

Descriptions of GILS

Below are several descriptions of the Government Information Locator System. The first is my own description, developed after having read the documents that guided the construction of GILS and after having used the GILS services available via GPO Access and various agency web sites. This description also reflects my training as a librarian who uses databases composed of records which can be searched via the Internet. My description is followed by several descriptions of those who participated in its development.

In general terms, GILS consists of several collections of carefully formatted records which are searchable using software that conforms to Z39.50-1995 and with the GILS Application Profile. These records are created for the U.S. Federal government at the agency level. Beyond the standard format of each record and their being searchable using Z39.50 software, the characteristics of these collections vary considerably from agency to agency based on local practice. Some agencies have used GILS to describe only a few collections of resources or the services available from a particular office. Others have used GILS to describe thousands of individual publications (one GILS record for each publication), collections of publications, and search resources. Several collections of GILS records have been made available by the U.S. Government Printing Office at http://www.access.gpo.gov/su_docs/gils/index.html. These collections of records are required to be included in agency Freedom of Information guides (OMB Memorandum M-97-10, 1997).

One way to further understand my description of GILS is to compare GILS with another Federal search service, FirstGov.[1] Conducting the same search of GILS and of the FirstGov[2] service (http://www.firstgov.gov) reveals a dramatic difference between the two services. Using the keyword, radon, the search of all of the GILS records available through GPO Access produced only four records with descriptive content. These records represent the National Radon Hotline, the Indoor Air Quality Information Clearinghouse, the EPA Technology Transfer Network, and the EPA Privacy Act Systems. The first three records describe Environmental Protection Agency program initiatives in detail, including an extended abstract describing the kinds of services offered, the mission and purpose for the programs described, and complete contact information. This information is similar in character to the kind of program-level information provided by the *United States Government Manual*. The fourth record listed the kinds of files the EPA maintains that include information about individuals. One of those files is called the Radon Contractor Proficiency Programs.[3] In contrast, the FirstGov search produced over 1,000 hits for the

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1 FirstGov is a search service provided by the Federal government. It allows users to search Federal, state, and local government web sites by keyword and returns a list of URLs along with brief descriptive information about each resource entry. The database searched was created automatically by search software which continuously indexes agency web sites. It reflects these agency web pages as they existed within the last few days.

2 These searches were conducted March 15, 2002. The results reported reflect GILS and FirstGov as they performed that day only.

3 One of the standard fields in a GILS record indicates the last date of modification. None of these retrieved records has been update since 1996. As a librarian, I would approach this information with some skepticism. Browsing through records from several agencies reveals that agencies manage their GILS records in different ways. Some agency records date from 1995 and 1996 when they were first created; others have been modified as recently as 2001.

word, radon. Of the first fifty, all but a few were from the Environmental Protection Agency. The results link to specific publications or parts of publications (executive summaries and chapters of longer works, for example). Although one retrieves a large collection of individual publications using FirstGov, one does not necessarily retrieve the kind of program-level and extensive contact information represented in GILS records along with those publications.[4]

Those who participated in the development of GILS have provided descriptions that vary widely from each other. In 1992, McClure, Ryan, and Moen produced a scientific report for the Office of Management and Budget describing the characteristics of currently available government agency information locator systems. They provided the following description for a proposed government-wide[5] locator (1992, p. 110):

> An information inventory/locator system is a machine readable database that identifies a range of information resources (e.g., databases, libraries, clearinghouses, print publications, bulletin boards, guides, etc.) and identifies what information is available in these resources. Usually, the information inventory/locator system does not, itself, provide the actual information, but rather points the user to the information source that does have the needed information.

GILS has frequently described as a virtual card catalog or a finding aid (Information Infrastructure Task Force, 1993; National Telecommunications and Information Administration, 1994; National Archives and Records Administration, 1995 for example). Christian, one of the primary developers and promoters of GILS, described

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[4] Sample GILS records are provided in Appendix D of this dissertation.

[5] "Government-wide" for the GILS project includes only the Executive branch of the U.S. Federal government. The guidance documents created by the Office of Management and Budget and by the National Archives apply only to these agencies.

it as one of the tools people will use for crisis management as well as casual browsing for information (Christian, E. (May 14, 1995). Re: Certification program for GILS).[6]

The National Institute of Standards and Technology described GILS as "a decentralized collection of servers and associated information services that will be used by the public either directly or through intermediaries to find public information throughout the Federal government (NIST, July, 1994, p. 34412). The Office of Management and Budget called it "an integral part of the Federal government's overall information management and dissemination infrastructure, and will ultimately facilitate both identification and direct retrieval of government information" (1994, December 7). This document expands on that description as follows:

> GILS will identify information resources throughout the Executive Branch, describe the information available, and provide assistance in how to obtain the information. It will improve agencies' abilities to carry out their records management responsibilities and to respond to Freedom of Information Act requests. It will also serve to reduce the information collection burden on the public by making existing information more readily available for sharing among agencies. . . . GILS will consist of decentralized agency-based information locator records and associated information services. It will use off-the-shelf communications and information technology products and services so that government information can be stored and retrieved in a variety of ways and in a variety of locations.

Christian (1994) describes and defines the required characteristics of the yet-to-be-developed GILS. This document was developed by agency personnel with information

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[6] This citation references a message posted on the GILS Forum, an electronic discussion list. This dissertation references many messages from the GILS Forum, many from the same poster. In order to facilitate locating the exact message, each reference to an email message will include the poster, the date of the post, and the exact subject in the text of this dissertation. The bibliography includes one reference to the GILS Forum, providing the URL for the archive of all the messages.

from information scientists and standards developers and was released May 2, 1994, by the Information Infrastructure Task Force. It referred to GILS in the future tense and required that GILS will be based on stable, extensible, widely-accepted national and international standards, including Z39.50 and TCP/IP. The ongoing development process used by GILS participants to extend these standards for GILS will be voluntary (e.g., ANSI, the Open Systems Environment Implementors Workshop, and the Internet Engineering Task Force). It will be based on client-server architecture and be decentralized in its creation and support. GILS will be directly accessible via electronic networks as well as alternative media like print, CD-ROM, electronic bulletin boards, microfiche, and so forth. The electronic records will be available in three formats: a generic record which can support HTML, a cataloging record, and an unstructured text record. The Federal GILS records will be available from the Government Printing Office as a directory of all GILS Core locator records. Those records–maybe as many as 100,000 of them or up to 1,000 per agency–will offer direct and seamless access to electronic resources. They will allow users (members of the public, intermediaries, information vendors, government employees) to access a single agency's records or records from several agencies, to browse through records, and to search record collections using keyword and fielded searching techniques.

In 1995, after several months of intensive development work, the Clinton Administration released this vision for GILS (National Telecommunications and Information Administration):

> Government agencies at all levels collect, maintain and disseminate an incredible array of information. . . . We know the information is out there, but how do we find it? Until recently, our only option was to write or call the agency that had the information. Of course, first we had to figure out which agency that was. And then we waited.
>
> All of that is changing. In December 1994, the Federal Government Information Locator Service (GILS) was launched. As it evolves, more and more Federal data will be at our fingertips. This locator service is similar to the card catalog at the local library, only it is electronic and on-line. GILS allows one to search on-line using a specific set of key-words of interest to locate appropriate subject matter. For example, suppose one had an interest in a major construction project and its effect on wildlife habitat. Using GILS, one could locate the various environmental impact statements. In addition, one might also locate pertinent satellite photographs.

Clifford Lynch, computer and information scientist, described GILS as "a way of applying human description to information resources, particularly at an aggregated level; many of these resources are big, rich and complex, and are not simply collections of static Web pages, which can be found by a Web indexer" (quoted in Sreenivasan, 1997).

William Moen, an information science researcher, described locator services in general and theoretical terms: "A locator service exploits the library's paradigm of resource description and resource discovery to assist users in discovery and retrieval of information resources. Metadata is the unifying technique for locator services." He further described GILS as follows: "The GILS concept focused on the use of networking technologies, metadata, and standards to enable distributed, agency-based locator services searchable using a standard information retrieval protocol to assist users in identifying and accessing/acquiring government information resources" (2001, p. 156).

Lytle of the Office of Scientific and Technology Policy described a locator as "a collection of references or citations to data and information; it indicates how to acquire

both data and information" (in Jadlos and Christiensen, 1994, p. 93). Jadlos and Christiensen summarized the qualities developers hoped to incorporate into a locator service for Federal government information resources: "An information locator is a point of entry that describes the content and location of the information within the organization. The locator always directs the user to the information sources that do provide the needed information and describes how it may be accessed" (p. 120). They define the purpose of the locator service as providing "the customer with sufficient information to determine where to look next. While direct access to the data from the locator service is desirable in the long run, it is not required or expected in initial implementations (p. 124).

As the above definitions indicate, the term "locator" was applied in several different ways throughout the GILS project. Readers of the formal documents and of the GILS Forum are forced to decipher the exact meaning from the context of its use. The term was used for the particular information that linked to the information sought, such as a hypertext link in a GILS record presented in HTML. It also referred to a particular record that conformed to the GILS Application Profile. It also referred to an entire collection of records describing a particular agency's resources. It was used to refer to other search services (such as online catalogs). It pointed to the software and standards resources that provided the search capabilities for the service, and finally, it was used for the entire government-wide service known as the Government Information Locator Service.

Although library science can be faulted for its own strategies for labeling things, it is helpful to trace terms used in libraries for somewhat parallel concepts to make visible a

difference. The particular examples used here are drawn from my own experience at a mid-western university. The locator as an institution-wide resource for locating information of all kinds does not exist in my library; the librarians I work with prefer to use specialized search interfaces designed especially for searching particular kinds of resources. For example, an interface for searching and retrieving court cases by parties or citations would not be nearly as powerful if one were searching for journal articles or books, and vice versa.

For particular broad categories of information, the locator is often described as a catalog or database, often further labeled to distinguish it from other catalogs (as in LUIS, the online catalog, or PsycINFO, an index of publications in the field of psychology). The text describing a particular resource (a book, a book chapter, or a journal article for example) is a record contained in that larger database. Further, text contained in the record in the online catalog might refer to the particular information that links the catalog user to the particular information. This linkage is frequently a call number, the string of letters and numbers on a tag permanently attached to a book on the shelf and included in the record describing the resource in the online catalog. In many online catalogs, this linkage may also be a hypertext link to an electronic database or document online.

The next section of chapter 2 reviews a variety of assessments of the Government Information Locator Service. This dissertation does not itself assess GILS. Its objective is to describe its development, particularly its development within the political system as defined by Niklas Luhmann's social systems theory (1995). These assessments are an important collection of publications about GILS. Some are brief judgments of whether

GILS was a success or not. Others are themselves detailed and rich reservoirs of communications about GILS, reporting on focus group and interview conversations, for example, communications that would not otherwise have been available to me.

Assessments of GILS

Several different kinds of assessments of GILS are available in the literature. They include formal, scientific assessments, critiques, and less detailed judgments in praise or condemnation of GILS. This part of chapter 2 reviews several of these assessments, beginning with a variety of indirect assessments, awards for web sites and for developers of GILS. It proceeds to more direct assessments of the characteristics of GILS and concludes with a review of assessments conducted scientifically.

Awards

Several organizations praised the GILS project as an innovative application. It was among 60 finalists for the second annual NII Awards Program in 1996. The program was designed as a public education campaign to promote the use of the National Information Infrastructure, the Internet. It showcased innovative, surprising, and clever applications developed for use on the Internet. Although it was not a final winner, it was included in a database that listed all of the applications submitted for consideration[7] (Christian, E. (November 13, 1996). GILS is finalist for NII Award).

In 1998 Eliot Christian, who provided leadership throughout the U.S. Federal GILS project and still maintains a web site in support of GILS, received from the

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[7] That database, described in this message as located at a particular web site, is no longer available there. The domain name was in March of 2002 available for purchase. Once a showcase of Internet innovation, now it is gone.

Coalition on Government Information, founded by the American Library Association, the Madison Award for his efforts in support of GILS. In the press release announcing the award, he was praised for his work in developing a "model standard," for "providing a framework to assist the public in locating and using government information, and for "providing developing countries with a democratic model of public access to government information" (Brodie, N. (March 5, 1998). Madison Awards press release (fwd)). The award and its description of GILS reflects the value the Coalition on Government Information placed on GILS.

Also in 1998, the Washington State Library was awarded a grant of over $100,000 to assist three other states in establishing their own government information locator services. (Palmer, G. (October 13, 1998). Washington State Library receives grant to distribute Find-It! Washington to three states). This grant, from the Institute for Museum and Library Services (IMLS), was one of only ten national awards in the Research and Demonstration category of IMLS awards. The Washington State service was based largely on the GILS Application Profile although it employed technology not available when GILS was first developed. As such, it can be considered a second generation GILS application. It was implemented using metatags and a structured thesaurus of keyword terms. Librarians who implemented the Washington GILS project were active participants in developing the second version of the GILS Application Profile. As this grant indicates, it was considered to be a useful and successful service.

Government Assessments

Government agencies also conduct their own assessments of their GILS sites. GPO, for example, includes in its annual review their assessment of their locator service (see GPO, 1999). That assessment consists of reporting on and describing the service they provide. GPO provides a search interface and hosts 15 Federal agency Web sites and databases of GILS records for over 30 agencies (Appendices D and E).

The General Accounting Office (GAO) assesses government performance continually. It considered the work of the Office of Management and Budget in relation to the implementation of the Paperwork Reduction Act of 1995 (1998), making reference to GILS (p. 13):

> Section 3511 of the PRA requires OIRA to establish and maintain a Government Information Locator Service (GILS) to assist agencies and the public in locating information and to promote information sharing and equitable assess by the public. OIRA staff with whom we spoke said they do not use GILS to identify potentially overlapping agency information collection requests. They said they were generally aware of potential information collection overlaps, and if unsure they would consult other desk officers or other OMB staff.

This indicates indirectly an assessment of the effectiveness of GILS by the desk officers in the Office of Information and Regulatory Affairs (OIRA). Rather than using a resource their office participated in designing to uncover duplicate requests for information, OMB personnel rely on what their OMB colleagues know.

Much of the government information resource management (IRM) literature suggests assessment strategies. These include researching best practices, linking IRM to strategic management processes, linking IRM to performance management, developing an investment philosophy, adopting business process strategies, and building partnerships

(Caudle, 1996). Best practices in 1996 were documented by Thompson and Gregg. They include in their list of best practices using GILS records to assist the public seeking information (p. 26).

One last article is worth considering (Zussy, 2000). It describes the Washington State Find-It! service which was built using the GILS profile. Zussy describes the value-added work librarians have contributed to make the Washington state GILS-based search service customer friendly.

Watchdog Assessments

Government watchdogs also have assessed GILS. OMB Watch has paid particular attention to this project over the years. In 1995 they described the implementation of GILS at various agency web sites (1995, p. 11-13). They noted that agency implementations of GILS had been uneven. Some agencies have extensive sites; others, none. They criticized agencies for providing descriptions of online documents and resources but neglecting to provide active links to those resources (p. 11). They also noted the lack of interagency activity and the lack of public citizen participation in the development and implementation of GILS (p. 10).

Two years later OMB Watch assessed GILS services again. They discovered that implementation was still uneven, that many records still did not include active links, and that many agencies cataloged only limited information. They noted that only two agencies sought out user perspectives, the EPA and the Department of the Treasury (p. 8). Many agencies were still out of compliance with OMB Bulletin 95-01, the bulletin that set out the initial requirements for GILS. They criticized the lack of OMB oversight and the

inactivity of the GILS Board (p. 15). They had attempted to gather information from GILS implementors by means of a survey instrument. Of the 200 surveys sent, only 10 were returned.

In 1998, OMB Watch again assessed GILS. They found much the same situation they had found in 1997, although they noted some agencies beginning to follow the lead of early adopters of GILS strategies, and they praised the work being done at GPO Access in providing one-stop service for many GILS sites (p. 3). Appendix E of this report listed the number of records and last revision date for each agency site, demonstrating varying agency attention to compliance with OMB requirements to continue maintaining their GILS records.

In response to a proposed revision to Circular No. A-130, Patrice McDermott, Senior Information Policy Analyst at OMB Watch, noted that the proposed OMB revision included the assumption that agencies had fulfilled their GILS mandate (2000). She disagreed with that assumption, including a brief assessment: "most agencies have no–or no useful–GILS presence . . put[ing] them out of compliance with the statute" (paragraph 1, 2000). She recommended that OMB revise the proposed wording for Circular No. A-130 to require that agencies build GILS records that assist the public in locating information and that serve as a "current and complete inventory of the agency's information resources" as required by sections 3511 and 3506 of the Paperwork Reduction Act of 1995.

How does a watchdog organization function in relation to the administrative sub-system of government? Personnel at OMB Watch communicate frequently with

government personnel. They persistently communicate about the difference between what they perceive the law requires and what they perceive government accomplishes. They lobby Congress, testify at congressional hearings, and host and attend public meetings. As critics, they present to government a representation of public opinion or possibly the opinion of the opposition party. When they communicate with a public audience, however, their communications describe the difference between public expectation and government accomplishments. Their assessment of GILS, then, functions as both a description and a criticism at the same time.

Reporters have a slightly different perspective on GILS. They tend to write about GILS when a study emerges or a deadline approaches. Houser, a webmaster at the Veterans Administration, encouraged other webmasters to implement GILS or lose control to the competition–GPO (Houser, 1995). Later, he compared GILS and other web-based access mechanisms to Beta and VHS videocassette formats. One is technologically better, but the other prevailed. He noted that "commercial Web search services are excellent and cost taxpayers and users nothing" (1997). He recommended that agencies ship their GILS records to the Department of Defense, NARA, or FedWorld servers[8] rather than trouble themselves with buying and installing Z39.50 servers of their own. Following his analogy to Beta videocassettes, Houser advocated "cutting bait" and letting the web search engines do the work online catalogs in libraries accomplish, locating the needed information.

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[8] He did not mention GPO's GILS services.

Scientific Assessments

Several research studies reference GILS, mentioning it as an indicator of quality to be considering when conducting an evaluation of web sites. McClure & Beachboard (1997) reference the requirements of OMB Circular No. A-130: "Web sites shall include location aids in compliance with Government Information Locator Service (GILS) policy and standards" (Chapter 2) and include it in a list of the policy assessment criteria (Chapter 3, table 4). They found that the GILS question required better definition and prompted two questions (Chapter 4, Part 4.5 Policy Assessment):

> First what constitutes an official record in a Web site environment? . . . . Mirroring that issue is the second problem of characterizing Web environments under any accurate and general definition. Web sites are both diverse and dynamic," and they suggest that "GILS has potential utility for identifying at least a minimum set of features every official information dissemination vehicle should have.

The Government Printing Office commissioned an assessment of electronic government information products (National Commission on Libraries and Information Science, 1999). This study focused on 314 government information products from 24 agencies. The methodology included sending a survey to the 24 agencies about the selected information products (74 percent response rate), visits to libraries, agency meetings, and expert interviews. At the agency meetings, the researchers asked whether agencies use locator tools. The survey contained a question about metadata. Only 27 percent of agency respondents reported that their products had any kind of metadata record (GILS or machine readable cataloging [MARC] records). Other respondents did not know whether metadata records existed (p. 37). Four of the five agencies the researchers met with maintained GILS records for their web sites (p. 58). Responses to

this question are included in Appendix G of the McClure and Beachboard research report, page 11:

> Most agencies indicated that the web format supercedes the original GILS concept. However, most agencies have their own locators:
>
> - NTIS has a catalog and maintains some GILS records.
> - EPA's website has a GILS record and they put all Internet products on one server so there is one access point for all their products.
> - Development and maintenance of GILS records is official agency policy for NARA.

As part of its expert interviewers, the researchers interviewed Linda Wallace, Chief of Electronic Information Services at the IRS, and Jerry Malitz, webmaster at the National Center for Education Statistics. Wallace identified GILS as a "subset of the 86 variables that go into the core knowledge repository" (p. H-10). Malitz referred to the Department of Education's locator and its participation in FedStats and the White House Briefing Room (p. H-11). They also interviewed Charles McClure, Syracuse University, who identified GILS as one of the top Federal information resource management challenges. Interview notes included "GILS does not work the way it was originally conceived" (p. H-28). The results of this study suggest a dogged acceptance by agencies to comply with the requirements to create GILS records in most cases while indicating little confidence in their utility.

Moen and McClure's assessment (1997) is probably the most extensive and best publicized. Power (1997) summarized its results and included optimistic response from Eliot Christian who thought a slow rollout of GILS might yield better agency results. Gellman (1997) praised the research, especially the web page usage statistics the

researchers analyzed. He encouraged webmasters to learn how to analyze their sites using this kind of data.

The Moen and McClure (1997) study considered policy, technology, content, and standards. It included user and stakeholder focus groups, agency site visits, policy review, analysis of web site transaction logs, and a content analysis of GILS records. The researchers concluded that the basic architecture of GILS still had validity. They noted elements that worked: the decentralized deployment within agencies, standardized metadata (GILS), and the use of the Z39.50 protocol for information retrieval. They also noted how GILS had fallen short of expectations. Implementation from agency to agency was uneven in its coverage and in its utility. It did not work like an online card catalog to the disappointment of public users. This study is a deep pool of valuable information about GILS. The archives of a discussion list that supported the work of this study are available at the web site of the Coalition for Networked Information (http://www.cni.org/Hforums/gilseval/).

The 1997 study follows other GILS research conducted in 1993 and 1994 (McClure, Ryan, and Moen, 1994). This report reviews the state of the art in network search and retrieval technology and recommended the use of Z39.50 as a standard upon which to construct GILS, and they presented an application profile that fully specified the requirements for a locator service. This profile was adopted by the National Institute of Standards and Technology as a federal information processing standard, FIPS 192, and by the Open Systems Environment Implementors Workshop, Special Interest Group on Library Applications as a voluntary international standard. They admitted the validity of

their recommendations could not be verified because there were no GILS-compliant systems in place at the time of publication. They relied on the theory of network externalities to predict that GILS would become a valued and popular public good, one that built on the compatible working together of government information, vendor-developed search software, and the Internet. To craft a profile for GILS at this time was not an easy task, given the rapidly changing environment for this work. That environment included significant changes in the political system and in relation to technological developments at this time. The environment was perceived by all of these systems as exceedingly complex. Members of the GILS Forum (described below) refined this first version of the GILS Application Profile to accommodate technology changes and to more adequately handle individual publications and publications in languages other than English.

Robert Gellman, former chief counsel to the House Government Operations Subcommittee on Information, Justice, Transportation and Agriculture, is a Washington privacy and information policy consultant. He summarized the findings of the 1997 McClure research report (Gellman, 1997):

> GILS' data descriptions are incomplete, the databases are insufficiently coordinated and hard to search, and connections to the underlying resources are mostly absent. Though lots of people turn to the Internet for government information, GILS is not a major factor on the Net. . . . The real fly in the GILS ointment was the unforeseen growth of the World Wide Web. . . . Of course, the Web itself has its own search-and-retrieval shortcomings, such as search engines that give you back 300,000 hits. GILS offers better data descriptions. But better descriptions are not enough to provide what users want today. The Web has made people expect to find data, not just descriptions of data. . . . GILS can be viewed as an experiment that fell victim to changing Internet technology. . . . GILS offered the worst of both worlds: centrally mandated requirements without adequate support or resources. This served only to stifle agency creativity.

One last assessment should be mentioned. Landsbergen and Wolken (1998) explored the legal and policy barriers associated with providing seamless access to government information. They praise the work done on GILS to reduce the barriers to government information.

As is clear from the preceding paragraphs, GILS has been evaluated in a variety of ways, by a variety of organizations, and with varying results. Many government agency personnel consider it a successfully completed task. Others do not find it useful. Yet other government personnel find the concept of GILS applied in a state library setting to be quite successful as a tool for assisting the public to find information. Public watchdog advocates judge it as falling short of its legislative mandate, and scientists find reason to both praise and criticize GILS.

The Communications that Shaped GILS

The communications analyzed in this dissertation are those that contributed to the development of GILS. They include communications that function with the political system (a concept developed by Niklas Luhmann and more fully described in chapter 3). As stated earlier, the political system is composed of three sub-systems, politics, administration, and the public. Politics includes political persons and party politics. Administration involves the communications that construct government and include law-making and the development of various government programs like the Government Information Locator System. The public sub-system generates public opinion. In addition to the communications of the political system, this review also summarizes various communications from science as they contribute to the development of GILS.

The Political Sub-System

Politics as a sub-system includes party politics and communications about political persons. The political communications that contributed to the development of GILS include Democratic and Republican agendas that date from at least the 1970s. The legislative mandate for GILS is the Paperwork Reduction Act. This act was first passed in 1980 by a Democratic Congress and signed into law by a Democratic president after the 1980 elections which swept a Republican majority and a Republican president into power. The act was motivated by the political understanding that the country suffered under too great a burden of government paperwork, much of it asking again and again for the same information. The drafters of the act, including Lawton Chiles, intended to discover those duplicate paperwork requests and alleviate the burden of too much paperwork by better management of government information resources. Key to that initiative was the Federal Information Locator System, a computer-based information system intended to uncover duplicate paperwork requests (Commission on Federal Paperwork, 1977). Throughout the 1980s and early 1990s, Democrats and Republicans held hearings about the Paperwork Reduction Act, about how the Office of Management and Budget was implementing it, and about how it could be improved. These hearings and reports included general oversight, interviews of political appointees, and reviews of proposed legislation (H. Rep. No. 560, 99th Cong., 2nd Sess., 1986; *Federal Information Dissemination*, 1989; *The Federal paperwork burden*, 1981; *Hearing on restraining paperwork burdens*, 1991; *Implementation of the Paperwork Reduction Act of 1980*, 1982; *Implementation of the Paperwork Reduction Act of 1980 (Public Law 96-511)*, 1981; *Implementation of the*

Paperwork Reduction Act of 1989, 1989; *Nomination of James F. Blumstein*, 1990; *Nomination of S. Jay Plager*, 1988; *Nominations of Francis S. Hodsoll and Edward J. Mazur*, 1991; *OMB's Office of Information and Regulatory Affairs Information*, 1994; *Oversight of the Paperwork Reduction Act of 1980*, 1983; *Paperwork Reduction Act Amendments of 1983*, 1983; *Paperwork Reduction Act Amendments of 1984*, 1984; *The Paperwork Reduction Act and its Impact on Small Business*, 1993; *Paperwork Reduction Act of 1994*, 1994; *Paperwork Reduction Act of 1995*, 1995; *Reauthorization of the Paperwork Reduction Act*, 1989; *Reauthorization of the Paperwork Reduction Act and the Office of Information and Regulatory Affairs*, 1989).

In addition to the hearings, legislators developed party programs during congressional debate. Consequently, the debates contained in the *Congressional Record* have been important for observing the political development of GILS. These hearings and debates reference other hearings, congressional reports, previously-passed laws, agency missions and programs, and court decisions (administrative communications in Luhmannian terms) as well as reports of public opinion (public communications).

The Administrative Sub-System

As just mentioned, the communications of the administrative sub-system include the hearings, reports, laws, and agency missions and programs observed by the political sub-system. These are binding decisions and the visible artifacts of government. They do not include the communications related to the politics about political persons and party platforms.

GILS and its predecessor, the Federal Information Locator System (FILS), are mandated by the Paperwork Reduction Act of 1980, its reauthorization and amendments of 1986, and the Paperwork Reduction Act of 1995. The legislative history of the 1995 act includes the history claimed by the 1980 act. The laws cited there constrain and define for government the way the Paperwork Reduction Act functions and what can be accomplished using it. They include the Federal Reports Act of 1942, the Federal Property and Administrative Services Act and its amendment (1950, 1962), the Budget and Accounting Procedures Act, the Brooks Act, Privacy Act, Clean Air Act, the Government Performance and Results Act, the Computer Matching and Privacy Protection Act, the Freedom of Information Act, the Chief Financial Officers Act, the Federal Acquisitions Streamlining Act, the Administrative Procedures Act, the Regulatory Flexibility Act, Clinical Laboratory Improvements Act, the Anti-Trust Civil Process Act, the Federal Trade Commission Improvement Act of 1980, Pub. L. 89-306, the Copyright Act, and the Paperwork Reduction Act of 1980.

Cited frequently as motivation for passing an amendment to the Paperwork Reduction Act after 1989 was the Supreme Court decision, *Dole v. United Steelworkers of America*. This judicial decision excluded from the regulatory review conducted by the Office of Management and Budget any paperwork imposed by an agency requiring a business to provide information to someone other than a government agency (required canned food labels or warnings of workplace hazards, for example).[9]

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[9] In Luhmannian terms, judicial decisions are developed by the legal system in the environment of the political system. The legal system operates in very different ways from the political system. Where the political system operates by means of in-government/out-

Administrative communications also include other binding decisions not crafted as laws. These include a variety of OMB communications. For example, OMB Circular No. A-130 (1985, and revised in 1993, 1994, 1996, and 2000) provides the Executive branch of the Federal government information policy guidance; OMB Bulletin 95-01 provides agencies with specific instructions for implementing GILS; and OMB Memorandum M-98-05 instructs agencies to continue to maintain GILS records even after the expiration of OMB Bulletin 95-01. Non-legislated binding decisions also include the government standard that set the required details needed for GILS records, National Institute of Standards and Technology Federal Information Process Standard FIPS Pub 192 (1995) and its successor 192-1 (1997). Another influential guidance document was published by the National Archives and Records Administration (1995), offering agency personnel detailed instructions for creating GILS records. The National Archives also held several training sessions to help agency personnel implement this guidance.

In addition to these publications which directly constrained the structure of individual GILS records, many other documents influenced the possibilities for constructing GILS records. For example, the Supreme Court decision, *INS* v. *Chadha* motivated the administrative sub-system to draw the boundary between the legislative and the executive branches of the Federal government more clearly. Legislators responded to this decision by establishing the practice that they could no longer exercise the legislative

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of-government and imposes power by means of binding decisions, the legal system operates by means of the legal code, legal/not legal. As such Supreme Court decisions, in the environment of the political system, perturb the political system, motivating many communications about these legal decisions within the political system. This will be more fully described in chapter 3.

veto. This affected publishing decisions as well. The Government Printing Office (a legislative branch agency) manages government printing (including executive branch printing) and was required to maintain a centralized point of access for GILS, but it did not influence the content or ongoing maintenance of GILS records–in compliance with its own binding decisions motivated by this judicial decision.

Other documents provided the developers of GILS with a vision for the final project. These include the 1993 Information Infrastructure Task Force *Agenda for Action* report and the 1994 document written by Eliot Christian, *The Government Information Locator Service (GILS): Report to the Information Infrastructure Task Force.* This report included the specific functional characteristics, drawn from the *Agenda for Action* document, that shaped how GILS would operate. It included the requirement for using voluntary international standards and other non-vendor-specific resources. It required that the solution allow agencies to create and maintain their own records, a decentralized management process that preserved the particular character and mission of each agency. At the same time, it insisted that the public be able to search the entire collection of GILS records to locate the information they sought. It required that the format for search results retrieved by this service take advantage of the technology available through the information infrastructure but not be limited to that medium.

These requirements were developed throughout the 1980s and early 1990s as agency personnel implemented technology for managing information and making it available to the public. This was not a smooth and direct process. It is represented in legislative hearings and reports (see for example H. Rep. No. 560, 99 Cong., 2nd Sess.,

1986; and *Federal information dissemination policies and practices*, 1989) and the investigative reports by the General Accounting Office (for example, *Improving mission performance*, 1994) and the Office of Technology Assessment (as in *Computer-based national information systems*, 1981; and *Informing the nation*, 1988).

Another category of communications that affected the use of the Federal Information Locator System and GILS is the executive order. In 1981, President Reagan issued Executive Order 12,291, setting out how the Office of Management and Budget would implement the regulatory requirements of the Paperwork Reduction Act. How this work was managed affected the relative importance of the FILS. The legacy of the practices established in 1981 and modified by the 1986 Executive Order 12,498 affected how government understood information resource management practices. These practices were disrupted in 1989 when funding for the Office of Information and Regulatory Affairs was not reauthorized and the Bush administration instituted the Council on Competitiveness to manage regulatory paperwork decisions. The target of strident Democratic criticism, the practices of the Council of Competitiveness came to an end with the inauguration of President Clinton who issued Executive Order 12,866 which dramatically decentralized paperwork control, instructing agencies to collaborate with the public in developing new information collection forms.

Other less formal communications are available. These include meeting minutes of the Information Infrastructure Task Force (1993-1995), the Solomon's Group (also known as the Locator Subgroup of the Interagency Working Group on Public Access) (Pesachowitz, 1992; Phillips and Carroll, 1993; and Jadlos and Christiensen, 1994) and the

GILS Subgroup of the Open Systems Environment Implementors Workshop–Special Interest Group on Library Applications (meeting minutes are available in the GILS Forum archive). Another group of resources that inform the development of GILS are journal articles written by well-informed authors like Timothy Sprehe (1995) and Gary Bass and David Plocher (1991). They provide a summary of government policy and review of the historical context for the development of GILS.

Another pool of communications representing the administrative work of developing GILS is the archive of an electronic discussion list, the GILS Forum. This archive includes nearly all of the messages posted to the list. It can be displayed in order of date of posting or searched by keyword. The messages included the decisions made in relation to the GILS Application Profile, a document outlining the data elements required for the U.S. Federal government GILS project. It also included communications about other publications that informed the project such as the McClure research studies described below, laws, OMB guidance, technological developments in the environment of the GILS project (such as the development of the Dublin Core profile and some of the technical development of Internet protocols). It identifies events as these are defined by the communications of those who participated in the development of GILS. These events include the acceptance by an international standards body of the GILS Profile, the publication of that profile as a Federal Information Processing Standard (National Institute of Standards and Technology, 1994 and 1997) the passage of the Paperwork Reduction Act of 1995, the development of OMB Bulletin 95-01 and its related requirements and deadlines among others.

The Public Sub-System

The public sub-system is composed of communications of public opinion. These communications are available in congressional hearings, newspaper and journal articles by non-governmental authors, and those who participated in the GILS Forum. Librarians and representatives of the business community were called on frequently to testify before congressional committee hearings about the implementation of the information policies associated with the Paperwork Reduction Act. By the mid-1980s librarians were demanding that government agencies make their electronic information resources directly available to the public (see *Reauthorization of the Paperwork Reduction Act*, 1989; *Federal information dissemination policies*, 1989, for example). Information industry vendors lobbied for ways to use electronic government information to build profitable information businesses and participated in the development of several large agency projects like Medlars (the online version of *Index Medicus*) and *EDGAR* (the Electronic Data Gathering System of the Securities and Exchange Commission). Of particular importance to this topic is the House Report No. 99-560, *Electronic Collection and Dissemination of Information by Federal Agencies*. This report reviews the practices of several agencies for developing electronic information services, the laws affecting those practices, and the demands expressed by the public for free, unfettered access to that data.

In the development of new government information policies, the debates over the Freedom of Information Act were particularly important. The public was vocally critical of how agencies were interpreting the requirements of the act in response to requests for agency information in electronic form. See Moore (1990) for a review of examples of

agency performance and criticism of that performance and how the act was being interpreted by agencies.

Another category of communications can be observed as scientific communications (in the environment of the political system), but they also are influential as representing public opinion. These include the scholarly publications of such authors as Peter Hernon (1989), Hernon and Relyea (1995), Bertot and McClure (1994), and Shill and Hernon (1993). These authors argue for policies that promote expanded access to government information.

System of Science

This dissertation is informed by the scholarly communications of at least two collections of science, that of social science and that of information/computer science. In the category of social science, of particular importance to this dissertation is the theoretical work of Niklas Luhmann (1982, 1986, 1987, 1988, 1989, 1990a, 1990b, 1992a, 1992b, 1993, 1995, 1996, 1997, and 1998). Probably the more significant of these publications is Luhmann's 1995 publication, *Social Systems*, in which he discusses his systems theory in considerable detail. For the political theory, his 1982 book, *The Differentiation of Society* and his 1990 book, *Political Theory in the Welfare State* were particularly helpful. His systems theory draws on the work of several other theorists, including Spencer Brown (1972) for his work on forms; Von Foerster (1984) for work on the nature of observing; Bateson (1980) for the definition of meaning (any difference that makes a difference); Saussure (1966) for his theoretical work in linguistics; and C.W. Mills for his theoretical exploration of the lexical nature of questions. Also informing this

dissertation is the application work of Krajewski (1997, 1998, and 2000) and Fuchs (2000) and the interviews in which Luhmann described how he conducted his work found in Klemm (2001) and Luhmann (1987, 1992b, and 1997).

In the category of information and computer science, the work of Charles McClure and several research teams is very influential. These include McClure, Bishop, Doty, and Bergeron (1990) who investigated the nature of early government agency locator systems; McClure, Ryan, and Moen (1992) for a follow-up to the 1990 study in which the rudimentary characteristics of a government information locator built upon the standard, Z39.50, were being worked out; Bertot and McClure (1994), assessing Federal government bulletin board services; Moen and McClure (1994) which present the first version of the GILS Application Profile; Moen and McClure (1997), the thorough evaluation of GILS. Landsbergen and Wolken (1998) provide a later positive assessment of GILS. Computer science made significant contributions to the GILS project, represented in Cerf and Mills (1990), Krol (1989), Lynch (1994 and 1997), and Preston and Lynch (1994).

Scholarly reviews of government information policy include Perritt (1992), Hernon (1989), Hernon and Relyea (1995), O'Reilly (1983), and Ritchie (1991). In reference to the scholarly discipline of political science and public administration, the work of Weber (1967), Waldo (1971), Wilson (1887), O'Reilly (1983), and Brown (1996) were useful. Although not informing the GILS project directly, the work of Gelernter (1998), DaCruz (2001), Kapor (1993), and Yanoff (1994) contributed to the author's understanding of the character of computer science and network development during the time GILS was under

development. The work of Aden and Harris (1993), Mills (1990, 1992), Cerf and Mills (1990), Crocker (1993), Ebel and Mills (1990), Johnson (1993), LeVan (1994), Lynch (1997), Wood (1994) contributed to an understanding of how *de jure* and *de facto* computer standards are developed by organizations.

Summary

The development of GILS spans a rich and varied collection of publications and communications. This review illustrates the complex character of the development of a government information service as it draws on the scientific research of scholars; the political communications associated with politics, administration, and the public; and as it develops in relation to a rapidly changing information environment.

The next two chapters introduce the theoretical and methodological framework for this dissertation, the structures that guided the analysis of this collection of publications. Chapter 5 presents a chronological review of events and explores at a theoretical level the development of GILS. Chapter 6 concludes this dissertation with a discussion that returns to the research questions introduced in chapter 1.

CHAPTER 3
SYSTEMS THEORY

Chapter 1 described the scope of this study, briefly summarized Luhmann's social systems theory, and introduced the research questions. Chapter 2 described the literature associated with this study, including the assessments of GILS and the communications which became the data for this project. Chapter 3 provides an introduction to the theoretical work of Niklas Luhmann. It includes an explanation of Luhmann's systems theory, his political systems theory, and the development of meaning in systems. Using Luhmann's theory has allowed the functional meaning (as meaning operates in functional systems) of the communications associated with the development of the Government Information Locator Service to become visible.

Rather than reviewing what happened, Luhmann's theory allows the researcher to observe the system of communications from which GILS emerged. From these communications the structures emerge that facilitate decision-making and the meaning of the service and its operations.

Luhmann's work is relatively unknown in the United States, although he is widely known and often cited in Europe. Therefore, the objective of this chapter is to provide a summary of Luhmann's theory that is robust enough to expose the theoretical constraints that have driven the selection and the functional analysis of the data for this study.

Luhmann's Social Systems Theory

Complexity emerges in the study of how government created GILS as one distinguishes the functional operations of the political system from that of other systems.

Employing a theoretical approach based on distinctions allows the complexity and peculiarity of political system operations to emerge. Niklas Luhmann's social systems theory employs distinctions as it observes the communications of various social systems. He operates within an integrated network of theories to observe social systems, exploring their communications with sensitivity for the meanings of those communications as developed by the system itself (Luhmann, 1995).

Using Luhmann's theory allows the observer to employ the strategies of the system being observed to observe that system and to juxtapose that system's structures against those of other systems (Luhmann, 1998). Not only did Luhmann theorize about social systems in general, he also described the function of the political system in particular (Luhmann, 1982, 1989, 1990b). Therefore, his theory provides both general and specific theoretical guidance for observing the development of the government information locator service, GILS.

Luhmannian Systems

Theoretically driven observing begins with the assumption that there are social systems. These social systems are composed of communications, and by these communications a system distinguishes itself from that which is not system, its environment (Luhmann, 1995). According to Luhmann, what is not communication is not social (1995, p. 408). By those communications a particular social system distinguishes itself from its environment. A social system's environment includes that which is not of that system, including systems which operate by functions other than those employed by the system under consideration.

Systems can also be defined more abstractly as a unity composed of "the multiplicity of its operations" (Luhmann, 1988, p. 161). A system is a network of operations; it operates by means of its own structural constraints. For example, the legal system is the network of legal decisions. These decisions make distinctions in relation to the form legal/not legal. The constraints have to do with the relation of one decision to other decisions and with the way the system excludes other possible kinds of decisions.

Luhmann describes many social systems, including the economic, the political, the family, education, and the law (see, for example, 1989). Each of these is composed of communications which function differently from those of other systems. For the economy, the communication is closely aligned with money, with buying and selling. For the law (that is, judicial law, law based on court decisions), the communications order themselves around what is legal and illegal. Whatever–including the communications of the political system–is not a communication about law is in the environment of the legal system.

Systems (composed of communications) construct their own boundaries by means of those communications. They distinguish themselves from their environment–the difference is their boundary. They observe their environment by means of their own communications. What they observe is not the environment as it is; rather, it is the environment as their communications describe it. The economic system, for example, selects from a horizon of possibilities and develops an understanding of its environment in economic terms, its own communication medium. It observes the family in economic terms; the family, however, observes itself by means of its own communications, love.

A social system, then, manages the infinite complexity of its environment by means of its system-specific selections. An advantage of this theory of system/environment differentiation is that the observer is able to develop a better understanding of the homogeneity of a functional system and observe events by means of the distinctions of more than one functionally differentiated sub-system (1995, p. 8).

Social Systems and Psychic Systems

Luhmann's social systems, being composed of communications, do not, then, include people. This seems counter-intuitive. We assume as a given that society is composed of people interacting with each other, that organizations have employees, that families have children and parents, that bureaucrats and politicians together make up the government. To observe social systems by means of their functions, however, requires observing them at a more abstract level, at a level that reveals how they function. Function draws our attention not to people or even to objects (Luhmann, 1995, p. 2), but to communications. Of course, people (psychic systems) are involved. Science is able to consider psychic systems in relation to social systems. They function in the environment of the social system, contributing noise to the communications of, perturbing, or interpenetrating the social system, but they do not compose the social system (p. 214).

Psychic and social systems share similarities, however. Both build functional boundaries that exclude the other, and both use meaning (1995, p. 3). The relation between psychic systems and social systems is described by the concept of interpenetration (210ff). The psychic and social systems reciprocally contribute to the consciousness (of the psychic) systems and the communications (of the social)(p. 215).

Many reviewers are critical of this distinguishing of psychic and social systems and of the exclusion of persons from the social system. This distinction, however, does not minimize the importance of human beings for the social system. This strategy opens the possibility to consider the individual apart from the social, and the social apart from whatever is particular to an individual (Luhmann, 1995, p. 212).

Social systems, as systems composed of communications, do not operate by means of concepts related to individual agency. Even in the system that develops between two individuals in a conversation, it is their communications which compose their social system while their cognitive operations are excluded; cognitive operations are available only to the individual psychic system. The two kinds of systems (psychic and social) may "fall together," but the meaning within the psychic system develops in cognition and in bodily feelings while meaning in the social system develops in communications (1995, p. 98).

Individuals do not steer, guide, control, command, dictate, or lead social systems; nor do individuals follow, obey commands, or suffer oppression in the social system. Even though a person may develop an explanation along these lines, and even though a particular social system may describe its functioning in such terms, from a social systems perspective the communications of psychic systems are either contributions to the social system or perturbations from the system's environment (1995).

For the observer of the social system, the characteristics of individual psychic systems (their personalities, work styles, educational backgrounds, geographic location, and so forth) are significant to the system only as those characteristics are selected by the

system and described as significant. Psychic systems express many characteristics the social system ignores, although it could be otherwise.

Characteristics of Social Systems

As social systems constitute themselves, they express a variety of characteristics. Below is a brief introduction to a few of these. Although the order of this section moves linearly from one characteristic to another, it is important to note that these characteristics of systems function in relation to each other and to the system as a whole.

Self-referentiality

Social systems function self-referentially. That is, they refer to themselves–their operations, their elements, or their own unity–in sustaining their own operations (1995, p. 9). They use the difference between themselves and their environment to create and employ their own descriptions of themselves. In this sense, they are self-referentially closed. Paradoxically, in developing their closed systemic character, they employ an awareness of and an openness to their environment. They construct and continually reconstruct the boundary by which they regulate their relation to their environment (p. 17).

Boundaries

The social system is separated from its environment by its meaning boundary. It is at the boundary that the social system makes note in its communications of the difference between itself and that which is not system, but environment. The boundary is a complexity gradient composed of meaningful communication. The social system side is far

less complex than the environment side as the environment is marked by far greater complexity.

In maintaining systemic boundaries, the social system does the work of further distinguishing itself from its environment. Social systems performing boundary maintenance develop strategies by which they self-referentially regulate their contact with their environment. These strategies involve self-organizing and producing (and reproducing) their own structures and components (including elemental units, processes, boundaries, structures, and their own systemic unity) from their own structures and elements.[1] This Luhmann refers to (after Maturana) as autopoiesis.[2] A requirement for autopoiesis is that the system express adequate homogeneity of operations which distinguishes this self-referential system from all that which is its environment. Social systems make their own identity, and they do it in such a way as to perpetuate their existence as distinct from their environment (1995, p. 37-40; 1990a, p. 3).

Media and Codes

Each social system distinguishes itself from its environment and from other social systems by the particular character of its communications, called codes and media. Codes

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1 Structures are the decision-making schemata available to the system; elements are the smallest indivisible units of the system. See also the glossary of social systemic terms, Appendix A.

2 Autopoiesis is developed by Maturana and Varela in order to distinguish the kind of operation they observed in biological systems from simple self-organization. Autopoiesis means self-production. Luhmann recommended two titles for further exploration of the concept of autopoiesis: Maturana, H. (1982). *Erkennen: Die Organization and Verkörperung von Wirklichkeit: Ausgewählte Arbeiten zur biologischen Epistemologie*. Braunschweig, Germany; and Zeleny, M., ed. (1981). *Autopoiesis: A theory of living organization.* New York.

are distinctions which guide selections for social systems. They are composed of a relevant meaning-bearing item and its counterpart, which may be a negation (Luhmann, 1982, p. 168). For example, the economic system functions by means of the code buy/sell. The medium used by the economic system to express (in its communications) this distinction is money. If the communication is not associated with buying and selling, and if the medium employed is not money or those socially constructed materials that substitute for money in society, then the social system is not the economic system. The political system functions by means of distinctions such as in-government/out-of-government and conservative/progressive, and its medium is power (binding decisions) (Luhmann, 1990b).

Observing

Social systems may be observed by themselves, by other social systems, and by psychic systems (1995, p. 109). An observation is made by a social system which itself has a boundary constructed through its own operations and by which it can be distinguished from its environment. The social system being observed expresses autonomy from other social systems. At the same time it may be perturbed by social and psychic systems in its environment, but it makes selections of its own to develop its response to those perturbations.

According to Von Foerster (1984), systems observing their environment have blind spots, unobserved and unobservable areas. This is true of social systems, as well. Each social system observes its environment by means of its communications and manages those communications by means of a functional code specific to that social system. Such

systemic specialization equips the social system for particular operations but leaves it unaware of operations outside itself. That is its blindness.

The advantage the observing system has (this system may itself be the same as the system being observed, and it may be a social or a psychic system) is that it can distinguish the boundary of the observed system and the distinction by which that system functions. As such, the observing system is able to develop meaning from noting the difference between the distinctions used by the system and the possible distinctions available in the system's environment. This is paradox-building work.

This process of observing social systems as self-referential and as distinct from their environments introduces an interesting shift in what one is able to observe. Rather than seeing only design and control within a social system, the observer discovers systemic interests in autonomy and systemic sensitivity to its environment. Attention to structural stability gives way to dynamic stability. Whatever seems inexplicable, whatever peculiar organization is displayed in a social system, becomes explainable (demystified) to the observer as expression of the self-production of the social system (1995, p. 10).

Double Contingency

Double contingency operates between different psychic systems, between different social systems, and between psychic and social systems. Systems experience double contingency as they orient themselves to that which is outside themselves–that is, to the Other. In this relation, social systems develop expectations, but it is not simply an expectation of the behavior of another system. Rather it is an expectation of the expectations of that other system in relation to the first system (1990a, p. 45). Luhmann

characterizes psychic and social systems as operating in a doubly contingent relation to each other, as "black boxes," each operating self-referentially, assuming the other is similar to itself, a necessary reduction of complexity (1995, p. 109-110). The other system is a black box because the observing system has available to itself not the expectations of the other system, but its own expectations of what the other system might expect.

Non-transcendence of Systems

In a modern differentiated society, no social system represents society as a whole; no social system assumes a transcendent attitude, not even the political or the economic systems, although each may communicate the assumption that it controls or dominates (Luhmann, 1990b). Each social system operates by means of its own communication code and its own medium and cannot employ the media of any other social system. This pattern is characteristic of all psychic and social systems and, thus, no system speaks–nor is it able to speak–definitively about society or the world as a whole.[3] Each system observes a problem by means of its own code. As such, each system develops an understanding of the problem that is distinct from those of other systems. Each contributes different possible solutions to society as a whole. Each seeks to satisfy different needs by means of the solutions it proposes. No system functions transcendentally.

Complexity

The elemental meaning of complexity for Luhmann begins with the distinction of element and relation. A system develops complexity as it discovers it is no longer able,

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[3] See, for example, Luhmann's exploration of the ecological environment by means of the political, economic, educational, family, and legal systems (1989).

because of constraints within elements, to relate every element to every other element; it is forced to make selections. Contingency[4] arises as a result of this need to select and, thus, risk also arises. Selecting among many possibilities gives rise to risk because it is possible that the system may select a solution that is less than the best for it.

Complexity also relates to the relation between the system and its environment. A system recognizes complexity by its inability to fully grasp and describe its environment. When a system perceives increasing complexity in its environment, it perceives an increasing difference between itself and its environment, and it responds by increasing its own complexity in the only way it knows how, by employing its own selection strategies, its own distinctions. It employs its own elements and structures (decision-making schemata), its own strategies for making selections to reduce and manage for itself the complexity of its environment (Luhmann, 1995, p. 23-29).

The Political System and its Sub-Systems

As stated above, the political system expresses characteristics common to all social systems. It is composed of communications and functions self-referentially, maintains its own boundary, uses media and codes, is constrained by double contingency, and is perturbed by complexity. It functions differently from other systems because it employs the medium of power in its binding decisions and distinctions having to do with in-

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[4] Luhmann links contingency to complexity because as soon as complexity arises, the system becomes contingent. Strategies for selecting, for making decisions having to do with the ordering of too many elements, follow this pattern. This ordering is neither necessary, nor is it impossible. By selecting particular relations of elements when confronted with complexity, the system orders itself into relations that might have been different had other selections been made.

government/out-of-government. Luhmann also outlines a structure for the political system that is far more complex than the structures he presents for other systems.

The Political Medium, Power

The political system integrates society by means of power in the form of collectively binding decisions (Luhmann, 1982, p. 144-145).[5] Rather than practicing a unidirectional application of power (force), however, the political system is most successful (and this success refers to its productivity) when it develops decisions that complement the themes of multiple systems. Only in this way can the political system expect society to accept political decisions as binding (1982, p. 146). Out of this process emerges a political legitimacy, and by this means the political system generates social power. This power is not simply the cause-and-effect force of military might or police action. Rather, it is many instances of social power that emerge through cooperative social interaction (1982, p. 147). Power accumulates through the many decisions that complement each other.

The political system produces and reproduces political decisions. As a self-referential system, it is itself composed of these political decisions and orders them in such a way as to continue to produce political decisions–this is the expression of its autopoiesis (1990b, p. 40). Every decision, every element, contributes to and refers back to the constitution of this system. By means of this self-reference, the political system makes

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[5] That is not to say that it represents society as a whole successfully to itself. If it did, it would overwhelm and destroy the other functional systems and, thus, society itself. Differentiation requires that the political system persist in relation to the other functional systems (1990b, p. 32-33).

possible openness to change, although that change is limited by the system's structures (decision-making schemata), thus expressing both open and closed characteristics. Through its own communications, politics makes itself sensitive to issues being communicated beyond its boundaries, in its social environment. It is this openness that makes possible the inclusion of the entire population in politics.

The Political Code

The political system uses the basic binary codes of in-government/out-of-government, majority/minority, and conservative/progressive. The abstract content of the code conservative/progressive is continuity and discontinuity: maintain current structures of the social system, or change them (Luhmann, 1990b, p. 65. See also 1982, p. 186). This code seems to function adequately within the political system, but it has limited usefulness when applied to the relation of the political system and its environment since the environment is changing rapidly. To keep up, the political system must reapply the binary to itself, producing the paradoxical pattern of conservatives (the opposition in this example) developing ideas of change in order to come to power, and progressives (in government) developing ideas of conservatism in order to maintain things as they are. Both the conservatives and the progressives, then, must refer to change.

Political Sub-Systems

The political system is composed of three sub-systems: politics, the administrative, and the public (Luhmann, 1990, p. 47). Politics determines boundaries and priorities for administrative decisions. The administrative sub-system (which includes legislative work) develops binding decisions that constrain both itself and the public. The public (within the

political system) reacts to these binding decisions through expressions of public opinion and, of course, elections. No part of this system dominates; it expresses itself as a cyclical, non-linear, non-hierarchical relationship (Luhmann, 1990b, p. 48).

The political sub-system includes the communications associated generally with political parties and personalities. These have since the late 19th century (possibly earlier in the United States) expressed themselves as permanent organizations which mediate the relations between the state and the public (Luhmann, 1990b, p. 48). Politics develops communications that distinguish differences between parties and help the public make voting decisions.

The administrative sub-system includes the institutions that create binding decisions–Congress, the Executive, the bureaucracy, and any other entities which contribute to produce those collectively binding decisions. This definition does not allow one to draw a simple boundary between members of Congress and employees of the bureaucracy, as represented in the *U.S. Government Manual*'s orderly diagrams and chapter divisions or in Woodrow Wilson's famous dichotomy of politics and administration (the politicians create law and the bureaucrats implement it) (Wilson, 1887).[6] Rather, the bureaucrats, members of Congress, and other interested entities work cooperatively to develop programming possibilities, draft bills, and monitor governmental

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[6] Waldo cites Wilson's 1887 essay, "The Study of Administration" as the source for this dichotomy. "Certainly he can be held to have argued that, in general, government is divisible between deciding and acting, between the political and the administrative, between 'Will and answering Deed" (Waldo 1971, p. 67). He gives Goodnow and Willoughby credit for explaining and complexifying further the dichotomy. Yet in his own experience in the Federal bureaucracy during World War II, he realized the inadequacy of this dichotomy.

institutions (Luhmann, 1990b, p. 49). The administrative sub-system directs its attention toward its system-internal communications about the other sub-systems of the political system, politics and the public.

The public functions in many ways in its relation to the political and the administrative. These include operating as taxpayer, voter, responder to opinion polls, author of letters to newspapers and congressional members, for example. Its communications are also expressed by interest groups and lobbyists (1990b, p. 49; 1982, p. 154).

These three sub-systems observe each other and themselves. When they observe each other, however, each does not observe the other sub-systems as they are in reality, but rather according to its own understanding. The political observes the administrative and the public sub-systems through its own elements and structures. The politician "knows" what the public wants, "knows" how the public will react to certain decisions. The administrator also "knows" the motives of the politician, and the public distrusts both politicians and bureaucrats. These are constructed concepts of knowing rather than direct observations of how these sub-systems "really" function. They are like everyday theories or black box observations, technically speaking, but one sub-system cannot penetrate the reality of those parts of the political system beyond its own boundaries (1990b, p. 52). Such observations contribute to developing sub-systemic rules for dealing with the other sub-systems in their environments, rules that contribute to their efforts to interact.

Luhmann identifies externalizing functions that develop from these inter-systemic relations. Between the public and politics, public opinion as reported by the mass media

functions as an external reference. For the relation between administration and politics, persons who hold office or who are running for office function as a similar externalizing expression (1990, p. 61). For the relation between administration and the public, Luhmann identifies law as the externalizing function. These are external points of binding agreement controlling the activities of both the administrative and the public. Significantly, laws are not one-way pronouncements that bind the behavior of the public. Rather, their success or failure involves the voluntary and uncoerced cooperation of the public, and bureaucrats have been known to not comply with legislatively mandated decisions.

Each of these–public opinion, persons, and law–are important topics for the other externalized perspectives. They are also "tried and true mechanisms" that facilitate smooth-working communications, but they do not exclude other options. Luhmann encourages the exploration of other options that grow out of self-observation within the political system (1990b, p. 64).

Complexity

Complexity is a topic of political attention (Andersen & Born, 2000). The assumption is that in time (past/present/future) the environment for the political expresses growing complexity (things were simpler in the past; they are more complicated now). In terms of communication systems, this means that the system experiences a growing surplus of available selections from its environment which it must manage. For the government, the Internet introduced a new and unfamiliar means of communicating with itself and with its public. Throughout the 1990s, the Federal government explored various metaphors and stories for understanding what the Internet was and how it might be used.

Examples include electronic bulletin board, ubiquitous network, computer network, web, World Wide Web, the well-known information super highway, information technology, and even Internet itself. These all carry meaning complexes and inferences not immediately apparent, but which become more available if challenged.

The meaning they all share, however, is that the Internet is something new; it is an addition to what was available to government in the past. Consequently, it increased the complexity of the environment for government. By means of these and other metaphors in relation to the distinctions of government, the political system developed meaning for this new technology, increased its own complexity and simultaneously reduced the complexity of the Internet to a manageable level.

Meaning Development in Systems

According to Luhmann, there are two ways of adding to scientific thought. One is to improve on the status quo, to iron out societal flaws, to strive toward perfectability, all the while relying on an empirical measuring of the given world and the scientifically discovered laws of nature.

This strategy suggests that the scientist recognizes a problem: the situation does not match some ideal. The scientist sees and measures conditions in the given world and develops a procedure that she predicts will change the world for the better, a strategy that will move the world toward the ideal. Having applied the procedure, she then monitors the improvement of the world by continuing to measure conditions and track trends toward that ideal. Several elements of this strategy suggest a priori assumptions are at play. One of these is that all that is really significant can be measured. That which is real can be

counted. Another assumption is that the world as it is presents a problem which can be dissolved with the application of a solution. The effect of the solution can itself be measured. This strategy also assumes that the world beyond the problem and solution under scientific consideration is stable and unchanging.

The other strategy for adding to scientific knowledge, according to Luhmann, is to begin with an assumption of improbability or ignorance. The scientist begins with an assumption that the success of a particular event is improbable, yet simple observation confirms that such an event occurs. One might even say that it occurs routinely. The scientist is able, by applying the assumption of improbability, to discover how the event under consideration is possible. An order–a constellation of structures–underlies the social processes that occur with a reasonable amount of regularity. A parallel process occurs when the scientist operates from the assumption of ignorance. Once the scientist disengages first impressions of knowing, she discovers that other ways of understanding an event are possible.

Neither of these beginnings, that of assuming improbability or ignorance, relies on monitoring that which can be quantified. Improbability and ignorance force the consideration of the relations among elements, and these elements may or may not be concrete things. In systems composed of communications, elemental communications order themselves into networks of communications which also negotiate with their environment. These can be communications about meaning, arguments, definitions, policy statements, traditional practices in a continuous process of autopoiesis (the social system sustaining itself by means of its own structures and elements). In observing these, the

scientist can then discover something about what makes the improbable possible, what ordering of the basic elements involved makes operations succeed. (Luhmann, 1990, p. 86. See also Luhmann, 1998, p. 75ff).

Luhmann's methodology emerges from the strategies of assuming improbability and ignorance. His theoretically driven observing does not begin with a certainty about what is observed; instead he begins by considering the improbability of success and with ignorance of how such a thing comes to pass.

The Improbability of Communication

Rather than beginning with the assumption that successful communication is likely, a study that assumes ignorance as its starting place will begin with the assumption that communication is improbable (1981, 1990, 1992a, 1996). Many barriers contribute to making communication improbable. A simple communicating of perceptions requires a common language, an agreed-upon subject, the willingness of those involved to contribute the needed time to the project, and the ability of the communicator to make her presence known to the other and to explain herself. In addition to the participants conforming to these simple requirements, meaning is understood only in context, and for each, context is supplied by that individual's own memory. Add to these difficulties the challenges imposed by time and distance. Beyond the obvious problems that can be overcome with some form of technology such as writing or telephones, the communicator has to solve the problem of holding the attention of the other individual. In writing, this includes particular strategies for ordering text. The structure and content of a letter to my mother is not

acceptable for my dissertation–and vice versa. Finally, once the communication is received and understood, it may not be accepted.

These problems also exist for social systems. The social system itself provides the context (its own structures and elements) for constructing and understanding communications. The social system manages its own strategies for giving attention to communication when time and distance present problems. Finally, the social system itself makes decisions about accepting or rejecting communications. The strategies associated with managing communications have to do with how social systems operate in relation to information, meaning, and complexity.

Information and Meaning

Information does not lay around, waiting to be noticed. For systems theory, it cannot be said to be given, to be always the same "thing" no matter who receives it, how it is packaged, or when it is received. Rather, information emerges as an event in a system. Using its own strategies for constituting meaning, the system notices information in its environment. It is surprised by the communication or it recognizes it as very useful. If this does not happen, what might have been information goes unnoticed; it is noise in the environment of the system. If a noticed piece of information occurs a second time for the system, it is no longer information (although it still has meaning in itself); it has no news value for the system (1992b, p. 54). The first weather report of the morning has information value; the second time it is reported, it is still meaningful, but it goes unnoticed.

Both psychic and social systems can be understood as meaning-constituting systems, not that meaning is created by the systems, but that systems manage meaning in functional ways by relating information to information, developing a web or network of meaning. Systems constitute meaning through a process of selection, through selecting something while leaving other possibilities available but in the environment of the system. This is how the system functions in the presence of complexity.

As described earlier, complexity is a characteristic of a system that is unable to make connections among all its structures and elements. By this complexity it is forced to make selections. Its decisions become contingent; by its own processes it develops strategies for selecting this and not that. At the same time, it is forced to take risks and to manage itself in the face of those risks. How it does this provides meaning to the system (Luhmann, 1990, p. 24ff, 82). For the system, meaning could be otherwise; it had other possibilities available to it. Those other possibilities are preserved in the environment of the system (p. 83).

Binary Codes

Social systems use binary codes to manage meaning. By means of binary codes they choose this and not that. The political system functions by means of such binary codes as in-government/out-of-government and liberal/conservative. By these codes, the system reduces complexity. Other selections are possible (such as buy/sell or legal/illegal); however, the political system reduces complexity by functioning only by means of its own binary code.

By these codes, the system sifts through possible selections from its environment. It makes selections using only its binary code to sort out that which is relevant from that which is irrelevant. For example, if congressional debate includes the topic of income tax reform, political parties consider particular proposals for reform in terms of the impact such reform might have on the next election. In the case of GILS, members of Congress argued for the public goods they linked to the GILS provision. They described GILS in relation to their objective to ensure "that the public has timely and equitable access to public information" and "to ensure improved public access to government information, especially that maintained in electronic format, . . ." and that the government reduce waste, reduce the paperwork burden on the public and improve government efficiency by means of information technology (141 Cong. Rec. S5277, Statement of Senator Glenn). These political selections ignore as irrelevant those selections that might be made by a computer business interested in landing a big government sale (buy/sell selection) or a family wanting to search MEDLINE for medical research about the degenerative disease of one of its own (love).

That which is relevant to the social system has as its other possibility, the negation of relevance (irrelevance). That which is irrelevant is held in the environment of the social system and is still available to the system by a process of negating that which had previously been negated. That the political system judges buy/sell and legal/illegal irrelevant to itself does not destroy those possibilities. That GILS was selected to improve access to government information rather than some other strategy available at that time, or that Congress had available a strategy to delay establishing this binding decision could

have been selected. These were possibilities available to Congress. Not selecting them did not destroy them, but only made them irrelevant. They were negated. To negate that negation is possible if Congress returns to the issue of improving access to government information.

The Theory of Forms

To consider these concepts at a more abstract level, it is useful to consider systems in general. The system distinguishes itself from its environment by the distinction system/ environment. It makes selections from its environment by a distinction relevant/irrelevant. The shape of all such distinctions is called its "form" (Spencer Brown, 1972). A form has the general character A/Not A. Together the A, the Not A, and the symbol separating them produce a unity.

The meaning of one side of the form is a consequence of that which is on the other side. When one draws such a distinction, one immediately makes an indication. Spencer Brown used the symbol ⌐ to indicate the nearly simultaneous character of this operation. The one drawing distinctions immediately prefers one side or the other of the distinction.[7] It is important to note that unlike Hegel's dialectics, the form does not indicate or end in a unification. In considering the distinction, one does not move from thesis to antithesis to synthesis. Rather, it is possible to indicate one side of the form, then to indicate the other, always with the possibility of returning again to the first side indicated.

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[7] Luhmann, however, used a simple slash (/) to indicate the boundary between one side of the form and the other. This is the practice followed in this dissertation.

Luhmann followed this form in considering the relation of system (and in particular, social systems) to its environment. The system is distinct from its environment. At the same time the system forms a unity with its environment. As with Spencer Brown's form, the system does not conclude in a unification of system and environment. It always expresses a difference between itself and that which it identifies as environment. It distinguishes itself from its environment by means of its boundary. If there were no difference, if the system were not distinct from its environment, the system would not exist. Difference is expressed in such things as the level of complexity and patterns of operation.

Functional Differentiation

Modern society is marked by many functionally differentiated social systems, systems which distinguish themselves from their environment in the form, system/environment (Luhmann, 1989, 1995). Each uses its own self-reference and its own positive/negative binary strategy for making sense, for distinguishing relevant from irrelevant. Examples of systemic binary codes include buy/sell for the economy, legal/illegal for law, and truth/untruth for science. These code values are available to both the system and to observers in its environment. They can be observed. It is by these codes the observer identifies which social system is under observation, and it is by these codes the system itself understands its environment (Luhmann, 1998, p. 11).

Paradox

Social systems considering communications from their environment draw distinctions based on their own binary code. This leads to a logical paradox, that is, a

paradox which involves turning a distinction in on itself. Spencer Brown (1972) developed a calculus for managing logical problems which had been pronounced out-of-bounds by Whitehead and Russell's type theory (paradoxes). Take, for example, the paradox, "This sentence is a lie." If something *is*, then its truth value is sustained across time, but when faced with this sentence, the observer has to make the distinction true/untrue and immediately indicate one side or the other. If she indicates the truth side of the distinction, she immediately runs into difficulties. Before she reaches the end of the sentence, she discovers that it turns on the truth and incorporates the untruth, the lie, into itself. This is the paradox. That which was external to the concept true (that is, the untrue), is taken along with true into true itself. Unless one unfolds the paradox, thinking is halted. In order to unfold the paradox, the observer draws another distinction, possibly something like now/later, thus incorporating time in the process of observing the paradox. The observer then notes one side of the distinction now and holds the other side in reserve until later.

In their operations, all social systems unfold paradoxes. If the legal system were to apply the distinction legal/illegal to itself, it would be paralyzed. In itself, it has no legal justification for applying this distinction in society. In the face of this paradox, the legal system draws a distinction in order to operate. It sets aside the question of legality as applied to itself in order to become productive.

Functional Analysis

By means of their meaning processing, social systems develop meaning boundaries. These may coincidentally lie along physical boundaries (as with a laboratory or a restaurant) but not necessarily. These meaning boundaries separate system and

environment and are marked by a complexity gradient. The environment is far more complex than the system. The social system is marked by recognizable structures and elements composed by the system while the environment orders itself as a horizon for the system. It contains everything that is "not system"–other social systems, psychic systems, and, from the system's perspective, undifferentiated complexity. Not everything in the environment need be identified by the system; it is irrelevant to the system. It makes distinctions in a self-reflective way, according to its own strategies for unfolding the paradoxes created by observing the difference between itself and its environment. This is what is meant by its functionality. It compares difference in relation to structural constraints oriented toward meaning, by which it selects solutions to problems. The chosen solution is one among many possible solutions, but the one selected is according to the preferences of the social system.

The function of the social system becomes apparent by these decisions. The system distinguishes relevant from irrelevant by means of its binary codes. The system does not respond to everything in its environment (that is, it doesn't constitute a 1 to 1 relationship with everything in its environment); otherwise, it would express no difference between itself and its environment (destroying its boundary), but it makes selections from many possibilities according to its binary code, its strategy for processing meaning.

A social system stands out from its environment for observation by means of its operations. It can be observed as either first-order observations (descriptions of what is happening) or second-order observations (description of descriptions of what is happening, according to the distinctions of a particular social system) (Luhmann, 1998, p.

19). These observations are actual operations of the observing system (which can be the same system as the one being observed). An observer observes by making a distinction (Luhmann, 1986, p. 181), a decision about distinguishing in order to create information (1990, p. 82). The social system draws distinctions specific to that system in order to develop meaning from the information they observe (1998, p. 18).

Observing communications involves sorting the significant from the insignificant. Social systems confronted with a problem will respond with meaning-generating communications which generate pressure to create options for the system (1995, p. 83). These are often made visible by something as simple as a question (Mills, 1940). A question functions as a lingual index in conversations, an index of motives and options (p. 905). As such, questions point to communications that reveal that more than one selection was available to the system. They also point to decision-making that revealed something about the structures that constrained and facilitated productivity for the system. When the system selects "the answer" to the question, it excludes available solutions at the same time it selects the chosen solution. The distinction between the answer chosen and the answers not chosen carries meaning for the observer. That these decisions might have been otherwise makes visible the structures that constrain systemic communications.

Also informing the analysis of data will be the distinctions Luhmann identifies as fundamental to the political system, the sub-systems of the political, the administrative, and the public. The structures (decision-making schemata) they use constrain their communications, making available to them only particular constellations of meaning.

The political system expresses particular kinds of communications related to power. The political sub-system distinguishes party and personality differences, the administrative sub-system distinguishes binding decisions, and the public voices its opinion. In observing the development of the Government Information Locator Service, these kinds of communications are marked as significant because of the character of the political system.

The Limits of Systems Theory

Before concluding this chapter, it is valuable to consider the limits of a systems theoretical project, to consider what Luhmann's theory does not allow one to accomplish. As described early in this chapter, Luhmann made a claim to universality for his systems theory by means of the system/environment distinction. At the same time, however, his theory accepts only that which makes system/environment distinctions.

No theoretical strategy can hope to reveal everything. Knowing something about what Luhmann's theory does not do helps to clarify what it can do.

Subjective Meaning

Because Luhmann differentiates social systems from persons, his social systems exclude a subjective explanation of the production of meaning (Kogler, 1997; Misgeld, 1994). In social systems composed of communication, meaning emerges from the communications of the system and are complex interdependencies with temporal and social meaning references (Luhmann, 1995, p. 74; see also Saussure, 1966, especially Part II, Chapter II). The metaphysical conscious subject is a concept Luhmann purposefully sets aside as unobservable. Consequently, one can neither observe nor discuss the

thoughts or desires of a person. One can only observe communications, and these are not intimately and irrevocably tied to an individual. Rather, they are shaped by what is possible in the social system, and their meaning emerges as a consequence of that social system.

For example, the communication, "I love you," means something very different depending on the social system involved. When uttered by a politician to his wife in the kitchen, these words are spoken by a husband in relation to family, operating by means of the medium love; when uttered by a politician at a political rally before a cheering crowd, these same words are spoken by a political personality in relation to the political sub-system, operating by means of the medium in-government/out-of-government. This difference can be observed. What the politician *feels* in either case, however, is not available to the observer.

Predictions

Systems theory does not aid in developing the predictive power of the social or political sciences. It does not assume a static Weberian political structure composed of fixed and official jurisdictional areas, a firmly ordered and hierarchically-organized system of supervision, orderly documentation of activities, expert training, and rule-bound management. The ideal type is marked by "precision, speed, unambiguity, knowledge of the files, continuity, discretion, unity, strict subordination, reduction of friction and of material and personal costs" (Weber, 1967, p. 214). On the contrary, through their operations, social systems continually evolve in response to their changing environments. What remains across time are structures which constrain decision-making, but in spite of those, the social system evolves. An assumption of stasis misses this change. What

emerges by using Luhmann's theory is the discovery of multiple causes for a problematic effect.

Related to the idea of stasis, predictability, and an imagined telos, is the idea of a moral imperative, an ideological stance by which to judge political processes or the means by which government disseminates information. Luhmann's theory does not lead to judgments like this (Holub, 1994). This dissertation does not discover what strategies work better or worse, more efficiently or effectively, or how government *ought* to work as these require a knowledge of the end of things or at the least a transcendental perspective. It provides a more precise description of the complex relationships at work in the political system as it manages new technologies and new services.

Luhmann has been described as a neo-Parsonian (Turner, 1998). He studied under Talcott Parsons in the 1950s, but by then he had already developed and published his own distinct theory for functional systems (Luhmann, 1987, p. 133). Rather than beginning with an integrated whole divided into functional parts, as Parsons did, Luhmann's starting point was with a distinction. Rather than hanging his theory on structure, Luhmann developed his systems from multiple possibilities (p. 133). Although Luhmann cites much of what Parsons discovered about functionally different social systems, he considerably expanded Parsons' theory by introducing other theories (mathematics, cybernetics, autopoiesis, communications, semiotics, for example) by which he builds a far more complex means of observing and describing systems.

Summary

Social systems are systems of communications. They express themselves self-referentially in relation to their environment. The difference between the system and that which is not system is the system's boundary, a complexity gradient which moves from relative simplicity on the system side to incomprehensible complexity on the environment side. Systems function by means of media and binary codes. For the political system, the medium is power expressed in binding decisions and its code is related to in-government/out-of-government, majority/minority, and conservative/progressive.

The political system, in response to the complexity of its environment, expresses itself in terms of three sub-systems, the political, the administrative, and the public. Their externalizing functions include office holders, binding decisions like laws, and various expressions of public opinion.

Complexity is a concern of the political. As it perceives the complexity of its environment rising, it responds by increasing its own complexity. An example of this, in the face of new technology, is the selections made by the political system for communicating with its public by means of the Government Information Locator Service.

Systems theory limits itself to operating by means of distinctions. As such, it excludes concepts we commonly take for granted such as subjectivity, simple cause and effect relationships, judgment, and the transcendental. However, systems theory offers the opportunity for more precise descriptions of social systems and the opportunity to develop rules for managing systemic relations with other systems in their environment.

Chapter 4 will describe the methodology used for this study. It is constrained by the characteristics of social systems described in this chapter. It includes a description of meaning development in social systems, the strategy used for managing the communications being observed, and how these communications were functionally analyzed.

CHAPTER 4
METHODOLOGY

Chapter 3 described systems theory in general, how systems develop meaning, and how the political system in particular functions. Chapter 4 will describe the methodology used for this study. It is constrained by the characteristics of systems as described in chapter 3. Niklas Luhmann developed a strategy for collecting, storing, and managing his research notes that complemented his theory of social systems. He called his note files Zettelkasten. This chapter includes a description of Luhmann's strategy, drawn from his own writing and interviews as well as from the description of a student of his. It also includes a description of how I managed my own notes, guided by Luhmann's strategy for organizing Zettelkasten, but adapted for use with bibliographic management software.

Managing Communications

Luhmann's initial theoretical assumptions are that there are social systems and that they are composed of communications. His methodology for theoretically-driven observing of communications (that is, how data is analyzed) must allow opportunities for the observer to observe the connections that the communications themselves make among themselves, to let the meaning emerge from the constellation of communications. Luhmann recommended to his students the system of note taking he used himself, called Zettelkasten (Luhmann, 1987, 1992b, 1997; Krajewski, 1998). He used this system to both construct lectures and to write from (Klemm, 2000). His notes about an essay or book (and he took notes on everything he read (Luhmann, 1997)) may have included a summary, his reflections, notes about what is not useful, how the author analyzed his own

topic, excerpted quotations with page numbers, keywords that serve as subject concepts to both distinguish the concepts relating to this piece from all other concepts and to relate that piece to others about the same concepts, and the works cited in the reviewed work (Luhmann, 1997; Krajewski, 1998, p. 6). He reported that he did not force something, but did only what seemed easy. He then wrote when he knew how a work went. He took stock of it in a moment, laid it aside, and worked on something else (1987, p. 145). His Zettelkasten also included notes suggesting paradoxes and paradox-building elements, concepts that challenge the phenomenological givenness attached to the communication being described (Luhmann, 1997; Krajewski, 1998, p. 15).

His was a manual process of hand-written notes using octavo-size paper (about 5 by 9 inches), each sheet labeled according to a numbering system he devised. This numbering system worked in a way that held the running text of a particular set of notes in order from sheet to sheet as the notes were taken. It also allowed him to interfile related notes from his later reading (Luhmann, 1992b). The number attached to a particular note had no *meaning* significance, but it permitted him to easily insert into the notes for a particular work additional notes from other works related to that initial work (Luhmann, 1992b, 1997, Klemm, 2000). For example, a set of sheets describing one publication might be numbered 57/1, 57/2, 57/3, and so forth. When he wished to file notes about a work related to the work described on sheet 57/2, he numbered the new sheet with notes from the second work 57/2a. He then filed 57/2a immediately after 57/2. Once he had inserted into the file the sheets related to that new branch, the next sheet to follow in the file was 57/3 with its running text that continued the text from 57/2 (Luhmann, 1987, p. 143;

1992b, 56). He used red ink marks to reference other sheet numbers in his file where more notes related to this particular note were located. In this way he made connections between notes, building over time a dense network of references.

He recorded in a separate file, called a register, complete citations and the numbers of the locations where he had filed notes related to the citation. The numbering strategy did not impose a content-based or meaning-based order at the outset of this note-taking process (as with a book classification, alphabetical, or chronological system). Instead, it simply provided in the moment of note-filing a permanent location for his notes, and it allowed the text notes themselves to reveal web-like relations based on the connections and references held in the work being described. The notes became themselves a self-organizing system. As such, the organization of the notes captured the relations contained in the works (the communications) themselves, yet it was not constrained by any over-arching order. It incorporated the possibility to make decisions about the relations (to select these relations and not others) contained in the collection of notes and to work in a non-linear fashion.

Luhmann identified advantages for this strategy of note-taking. It allows the growth of internal possibilities across time, as the observer tracks down new references, without having to decide the structural order of the whole collection before the research began. His own Zettelkasten began to develop when he was a student in the early 1950s and developed throughout the rest of his life.

A second advantage of this system is the ability to pay attention to the references within a series of sheets. This process also allows collections of references to grow in

complexity as they repetitively reference other references. Soon patterns of communications emerge in the note file, patterns made visible through repetition within the communications of the system (1992b). In addition, research could begin anywhere in the collection (1987, p. 142-143).

Another advantage is that this process dissolves the possibility that privileged ideas might control the truth value of other communications (Luhmann, 1995, p. 76). Each communication is itself only an element in the collection of communications. If a concept functions to structure the operations of the system, it emerges in the communications themselves, not from an external source. Its relation to other communications, its importance to the system, is held in the references contained in the note file (Luhmann, 1992b, p. 58).

Luhmann searched his notes by two methods. He could begin with the citation card in his register, following his numbers to wherever the notes landed in his filing system. He could also begin with a keyword concept, dipping directly into his notes at the place where such concepts tended to collect as they related to an initial reference. He called these collections preferred centers, cultural lumps and regions, where he worked more frequently than other places in his filing system (Luhmann, 1987, p. 149-150; 1992b, p. 55, 57).

His strategy for conducting research involved first identifying a problem. When a problem came to his attention, he considered it by means of structural differentiation, self-referential systems, and their binary codes. He pulled notes from his collection related to the problem and these social systems issues, spread them on tables which were organized

in a circle around him, organized and reorganized them, sifting through different possibilities, until he was able to develop an outline for his work. Through this nonlinear process, this conversation with his own collection of notes, new ideas emerged. (1987, p. 144).

Krajewski (1998) provides additional detail concerning Luhmann's methodology. He reports that Luhmann described his own notes as the smallest building blocks for a social system. When observing his notes as communications, he asked his communication and research partner (his collection of notes) a question of interest to him, then searched his notes for a possible answer which he was able to accept or reject. "Then," Luhmann said of his own research experience, "when I stumble headfirst down the path, suddenly there is a form," as though it takes him by surprise (quoted in Krajewski, p. 13-14). Before him was the possibility of *this* or *that*. His Zettelkasten provided him collections and cross-references that led to new answers and new questions, all combining into a recursive communicative network, reproducing communication.

Krajewski further described Luhmann's endeavor to overcome conventional understandings of communications. He applied catachrestic concept structures to undermine the event-like character of the text. In other words, he challenged the meaning of the text by confronting the concepts of one system with those of another (for example, confronting concepts of the economic system with concepts of the family system or by applying a system's binary code back onto itself in ways that cause paradoxes to emerge). In this way Luhmann developed a conversation between himself and his notes (p. 15). This strategy invited the concept of constant doubt to be his research partner along with his

notes. Although a first glance at the data is phenomenological, the second becomes analytical, one in which both the notes and the researcher communicate in an immanent sense, an emphatically self-referential process (p. 16).

Out of this strategy, in conjunction with the organization of the original notes, arose the possibility for surprise and coincidence. Unforeseen connections arise (surprise!), and repetitions of connections come to the researcher's attention (coincidence). The researcher gathers these surprises and coincidences into notes which can then be used as building blocks for describing the social system and its structures (p. 17).

Computerizing Luhmann's Strategies

Krajewski developed computerized strategies for collecting, storing, remembering, and searching out notes (Krajewski, 1997, 1998, 2000). The design of his system (2000) is sensitive to the processes made possible with Luhmann's paper-based system without being bound by the constraints required by manual note-taking and paper-based files. His electronic records hold citation information, subject terms, cited references, and researcher's notes. It includes a search engine for sorting out records containing a particular reference or keyword rather than the register Luhmann relied on for searching through his manual system of notes. When a work referenced another work, he included that reference in his own shorthand in the notes about the work he was reading. For example, a reference to Luhmann's book, *Ecological Communication*, would be "Luhmann:1989" at the place in his notes for that citation. He was able to search his database for "Luhmann:1989" and retrieve every reference to that work.

For this project I have followed Luhmann's strategies for note-taking, recording quotations, noting references, and introducing paradoxes and paradox-building arguments. I have followed Krajewski's lead, though, using an electronic bibliographic database, one that functions in ways very similar to Krajewski's system. EndNote 4.0[1] is bibliographic utility software which provides structured records for collecting and preserving relevant bibliographic information. It provides customized records for various kinds of resources. For example, the information needed to identify a public law is far different from that needed to identify a journal article or a book. This software provided the needed fields to accomplish this efficiently for several kinds of standard works. It also allows the user to create customized records for more non-standard works. In addition, it includes a powerful search facility used to retrieve related records.

For this research, I created a customized file for logging electronic mail communications, the messages posted to the GILS Forum. This file format included the fields in Table 1.

Table 1

Customized Fields for Documenting Electronic Mail

Sender	**Year**	**Subject Line**
Discussion List	**Date**	**Keywords**
Abstract	**Original Email Message**	**URL**

[1] EndNote is available from ISI ResearchSoft, Philadelphia, PA 19104-9981 and online at http://www.endnote.com.

EndNote had the ability to match earlier entries and automatically complete the content of certain fields. When typing the Sender's name, the software automatically searched the index of authors and provided possible matches. It also automatically provided matches for the keyword field. This sped the input of author/sender data and was a great advantage for standardizing keyword concepts. Once I entered the first few letters of a keyword, the software provided a list of matches from which I could select.

To manage the messages posted on GILS Forum, I copied each message into the "Original Email Message" field, then copied and pasted the subject line from that into the "Subject Line" field. I then completed the sender, date, discussion list names. Then I read the message, making note of concepts in the message in the "Keyword" field. I summarized the message in the "Abstract" field and wrote any notes or questions for myself there. For some long messages, I inserted my notes in bold in the midst of the message. The bold font helped distinguish my notes from the original message.

If a message referenced another message, early in the research I included the sender name, date, and subject. Late in the research, I began to use the file number supplied by EndNote. I found that the citation form devised by Krajewski did not provide adequate information to distinguish one email message from the many others posted by the same sender to the Forum in that year. The file number provided a much more efficient means of moving from citing work to work cited in my notes.

This was not the case with publications, either journal articles or books. For these, the format author:date seems to have been for the most part adequate. For some published authors intensely involved in the GILS project, I added the record number to the

author:date structure. Maintaining that structure sustained the information content of date and author's name not available in a record number.

Finally, I included the URL for any resources described in the message in the "URL" field. If I had downloaded a referenced work to my own computer, I also included the location on my hard drive for that work in this field (using an automated linking feature provided by EndNote). The URL is clickable in the software, automatically opening the appropriate software for reading the file. For example, if the file is a pdf document, the software opens Adobe Acrobat; if it is html, Internet Explorer. A typical message is included in Table 4.2 to demonstrate the strategies described above. I wrote far more extensive summaries and author notes for laws and publications than I did for this sample record.

After compiling notes on every message posted to the GILS Forum and on the works cited, I worked through the data to clean up several duplications and redundancies. For example, I read through the keyword list and found similar terms referencing a particular concept, law, or agency name. I selected one and changed the keyword used in the files to the preferred form, then I deleted the form not preferred. I also went through the data and inserted more links between messages, having recognized an initially uninteresting communication as relevant to list members because it was frequently referenced in other messages. I added to some author:date references their associated record numbers to facilitate easily moving from file to file within the database. Because there are so many possibilities for searching within EndNote, I did not expend a great deal of time on this process. EndNote allowed me to sort the whole collection of references by

author, title, and record number as well as to search the collection or a subset of the collection in a wide variety of ways. Sorting through the data is not dependent on thorough going consistency of applying the author:date or record number strategies throughout the database.

Two kinds of research processes were possible with this set of electronic Zettelkasten. Using the search facility of EndNote, I was able to search for every reference my note-taking had captured for a particular publication to discover the constellation of communications that has developed in relation to that particular communication. Second, I was able to search for concepts that were associated with these publications (either they occurred in the text or I assigned them to texts that described such concepts. For example, if costs were discussed in a text, I assigned the concept "economics" even though the term might not have been used). This allows both the ability to differentiate clearly between concepts and to broaden the meaning of terms, a process of drawing distinctions and reducing complexity. With these communications sorted out from all other communications, I was able to observe relations emerging between terms and references, to see patterns of operations, structures that constrained and facilitated decision-making in the system under observation. I was able to discover and confirm by the repetition of references or concepts in the collection their significance to the development of GILS. This, however, is not a decision based on quantity of responses associated with a publication or concept. Rather it is a record of the ongoing, long-term (or short-term but intense) attention the social system paid to a particular concept or reference and not to others.

Finally, I was able to organize these records in ways to facilitate the description of these patterns of operations, to identify structural differences, self-referential systems, and the binary codes by which they functioned. The difference between my electronic Zettelkasten and Luhmann's is that his manual system allowed him to spread his books, articles, and notes out on tables that formed a circle around him. A quick scan of the tables brought to his attention information about the relation of records to each other, the depth of the pile clustered around certain concepts, and surprising connections between neighboring notes that occurred by accident on the table. Rather than piles of tangible paper, my system retrieved to the computer screen collections of electronic records with keyword links or references to other records.

This process of organizing and observing communications reveals the empirical nature of Luhmann's work. Even though his work relies heavily on theoretically developed relations, it operates at the empirical level, observing the communications the system itself produces–and they really are there (Luhmann, 1992b, 53). As such the boundary around the collection of data being used in this study developed as I worked with each communication. The communications themselves referenced other communications which themselves referenced additional communications. The system of communications determined the boundary that contained the collection of communications which I observed.

Limitations of the Software

I found that using the electronic bibliographic software allowed considerable flexibility in recording notes and preserving the files. I found, however, a few limitations.

EndNote provides automatic completion for only three fields, author (or sender in the case of email), keyword, and journal titles. It would have been a better strategy to use the "Journal" field for "Discussion List" in the customized record format for Email Communications. This would have allowed me to take advantage of the automatic completion facility rather than typing GILS Forum for each message analyzed.

EndNote could also improve its software by adding an automatic spell checker to catch my typing errors and the ability to search the content of a particular record by keyword. When searching the entire database for keywords, the results list often contained records where I had taken many notes or had included the full text of the resource. To locate the keyword, I either browsed through the record line by line, or I copied the notes field into WordPerfect and used its search facility to locate what I needed. While looking at the record in WordPerfect, I was also able to take advantage of its spell checker and fix misspelled words in my notes.

I also ran into the software limit for individual record size for especially long messages. The maximum field size is approximately 8 pages of text; the maximum record size, 16 pages. Therefore, for electronic mail messages, this was not a common problem. When it occurred, I split the resource between two EndNote records, duplicating the citation information to assure complete identification of the contents of the file. The allowable size for an entire EndNote library, the term used for a collection of records, is 32 MB. The size of the EndNote library as of March, 2002, was about 8,500 KB (ISI ResearchSoft, p. 45). This limitation will eventually impose a problem Luhmann easily solved by adding new boxes for holding notes wherever his files became crowded. I will

(unless ISI ResearchSoft overcomes this limitation) eventually have to begin a new EndNote library and conduct duplicate searches in both libraries, but that was not necessary during this research project.

Another limitation was that, unlike Luhmann's tangible sheets of paper standing in file boxes or spread out on a table, the bibliographic software held files in an invisible space, displaying only a few at a time. I used the software's search facility to overcome this, generating lists of files containing concepts, keyword phrases, author:date references, or record numbers to discover those cultural lumps. For particularly difficult or complex concepts, I printed the related records and organized them manually and added hand-written notes and references to other notes.

Drawbacks of the Methodological Strategy

In considering the limitations of Luhmann's theoretically-driven strategy for research, I agree with Luhmann that his strategy does not yield quick usefulness (Luhmann, referenced in Krajewski, 1998, p. 4). Throughout the research process I operated in ignorance. When asked what I was learning about the project, I was forced to admit to not learning very much until I was at the stage of observing the connections among the references in my database of notes very late in the research project. I relied on Luhmann's encouragement to organize notes for the long term (Luhmann, *Lesen lernen*, 1995, unpublished typescript referenced in Krajewski, 1998) and the tangible evidence of his published record. I would not recommend this strategy to those with a low tolerance for ambiguity or uncertainty or to a researcher who is both new to a topic and operating with a near-term deadline.

Advantages of using Bibliographic Software

The bibliographic software was equipped with powerful search capabilities. As described above, I had the ability to search the entire collection of references by keyword or by limiting the search to particular fields (like author, title, date). If it was helpful for the purpose of analysis, I could export those search results and segregate them into a new database for further analysis.

I was able to easily copy the entire reference database from my hard drive to a Zip Disk or attach it to an email message and transport it via the Internet to another computer. This allowed me to rapidly and easily back up my entire project. I routinely made back up copies of the database and my own writing to be stored off-site.

Working almost entirely with electronic data (the GILS Forum and most of the referenced resources) allowed them to be stored on the computer's hard drive. I was able to copy and paste quoted text from notes to the document being written, unlike Luhmann who relied on a typewriter for his writing. I was also able to automatically insert references and build my bibliography in APA style using the add-in facility that allowed EndNote software to interoperate with my word processing WordPerfect software. This process was not perfect; it required touching up those references, but it was a quick way to collect the details needed for the citation.

That the project was nearly all electronic gave me another benefit: the luxury of portability. The whole project was contained on a laptop computer and carried from home to office, into the yard, or on a trip.

This resulted in another benefit, that of simple neatness. The data was stored not in boxes of files, but on the computer hard drive. In addition, using electronic notes required no refiling as was the case with Luhmann's paper system of numbered notes. Once I had recorded notes from the data, I did not struggle with the experience of searching for misplaced or misfiled notes. This was not the case for all of my data. Photocopied journal articles and no-longer-available Internet documents contributed their own opportunities for search again for what had been at one time found.

Using bibliographic software has another advantage of nearly unlimited ability to expand the collection across time. When my current collection of notes reaches its limit, I will be able to open a new library within the bibliographic software. Moreover, should the time come that the software currently being used is no longer available because of the introduction of new operating systems, I expect to be able to export the data in a standards-based format (in Refer/BibIX, BibTex, or RIS) to facilitate moving from one software package to another.

Cost is another consideration when conducting research. I gathered most of my data from readily available free sources on the Internet. I stored my data on the hard drive of my computer (and in back up files), and I used only the software for my project that I already owned, bought previously for other projects (WordPerfect Office and EndNote). My research was also supported by the services of my university library. Resources used included the generous grant of no-cost and effective interlibrary loan services, a typical regional university library collection, a Federal government documents collection, a useful variety of reference indexes that included Lexis-Nexis Academic and Congressional

Universe and Public Affairs International Service (PAIS), and the grant of time for conducting the research in the form of a summer study leave.

Summary

This chapter described how social systems manage meaning and how communications are functionally analyzed. Systems manage meaning in their operations as they make distinctions. The particular character of those distinctions, the binary codes used, reveal the functionality of the system. A social system can be observed in two ways, as first-order and as second-order observations. A first-order observation describes what is happening. A second-order observe is a description of a system's own description.

The strategy for observing systemic communications used in this study was similar to that developed by Niklas Luhmann. I used electronic bibliographic utility software to record notes and then to analyze them in order to reveal patterns of communications that reveal how the systems functions to develop the Government Information Locator Service. The chapter concluded with a description of the advantages and limitations of using Luhmann's theoretically-driven methodology and of using electronic Zettelkasten.

The next chapter is a description of how GILS was developed. It considers how the political system managed by means of its own structures to develop GILS, how it managed problems associated with new technology, and how these contributed to the development of a service that some describe as problematic. The final chapter reviews and summarizes this research project.

Figure 1

A Typical Message and Accompanying Rudimentary Analysis

EndNote 4 - [Christian, 2000 #1735]

Sender
Christian, Eliot

Year
2000

Subject Line
Updating GILS Web pages

Discussion List
gils forum

Date
2000/09/22

Keywords
FirstGov
FedSearch
http://www.gils.net/

Abstract
Christian is updating the web site and wants to include software and procurement information. He will include the FedSearch and FirstGov procurements. **This is the first mention of FirstGov, although Inktomi was mentioned (#1731) earlier.**

Original Email Message
Message-Id: <4.2.0.58.20000922070740.00a47100@gsvaresm03.er.usgs.gov>
Date: Fri, 22 Sep 2000 07:12:44 -0400
To: gils@cni.org
From: Eliot Christian <echristi@usgs.gov>
Subject: Updating GILS Web pages

I will be updating the stuff at <http://www.gils.net> and I want to pay particular attention to software products and procurements. I'll post the GILS-compliance language in the recent FedSearch and FistGov procurements. Please send me other examples we can post for information. Also, please send me updates on any GILS related freeware or commercial software so I can post that info as well. And, of course, any other suggestions or updates would be most welcome!

Eliot Christian, US Geological Survey, 802 National Center, Reston VA 20192
echristi@usgs.gov Office 703-648-7245 FAX 703-648-7112 Home 703-476-6134

URL
http://www.gils.net

CHAPTER 5
THE MAKING OF A NEW GOVERNMENT INFORMATION SERVICE

Chapter 2 describes the resources used as data for this dissertation. This chapter, in relation to the theoretical and methodological constraints described in chapters 3 and 4, describes the development of the Government Information Locator System (GILS). This description emerges from the communications of those who developed GILS. The resources cited by various developers emerge as the significant constraining elements of this development process, although other resources were available in the environment of this development process, available to function as different constraining elements.

This chapter is organized into four parts. The first part is a general chronology of events, most of which were defined by the GILS Forum and in Congressional documents as events. Other events included are references to publications and communications that suggest the elements available to (or communications in the environment of) the developers. These are generally related to the development of the Internet. The second section of this chapter concerns the Federal Information Locator System (FILS), including a chronologically ordered review of events found in congressional documents and a theory-driven exploration of meaning related to those communications. Following that is a similar section on the Government Information Locator Service (GILS). The chapter ends with a more theory-driven discussion of the development of GILS.

The chronologies here cannot be taken as the definitive ordering of events; others are possible. For example, Moen and McClure discovered in their 1996-1997 research

project that many agency personnel were ignorant of guiding documents which had been disseminated years before. For those personnel, then, these documents emerged quite late in their experience of GILS. The same guidance used by some to design and build GILS was used by others to bring other independently-constructed indexes into compliance. Therefore, the communications available to these agency personnel at a particular date were quite different from what a simple date-ordered chronology suggests, being driven not by date of publication or date of communication on the GILS Forum, but by other systemic constraints. Personnel who participated in meetings and other face-to-face events might describe the chronology quite differently and include different communications that they interpret as events. The description presented here grows from the social communications available to this observer.

The second part of both the FILS and the GILS sections of this chapter include an expanded description of the legislation and guidance documents that functioned as structures for the development of these services. These are not resources selected to serve as a review of the published literature, nor are they resources chosen for their significance to political science, social science, library science, or other disciplines. These are the resources referenced by those who participated in the communications that contributed to the development of GILS, including those cited by the participants of the GILS Forum (the electronic discussion list used by those who developed and implemented GILS) and the communications contributing to the legislative and regulatory documents that constrained GILS.

The last part of chapter 5 raises the level of abstraction to reveal the decision-making strategies used by the system that developed GILS. Attention here focuses on those strategies used by the developers from the early decision-making to the final implementation and refinement of GILS. This section of chapter 5 describes that which can be considered from Luhmannian theoretical assumptions as generalizations. Rather than basing generalized conclusions on statistical logic, Luhmann's theory discovers generalizations in the abstract nature of the communication structures and media codes used by social systems. The chapter ends with a brief summary of observations.

Part I: The General Chronology of Events

Because of the complex nature of the development of GILS, a simple date arrangement presents difficulties for description. In spite of that, the chronology presented here provides an ordering of events in date-arranged time; it functions as a strategy for reducing complexity. It should be noted that this is not necessarily how these events occur within systems. An event occurs to a system when that system takes note of it. For example, a Federal standard, FIPS 192, was published as a draft six months before it was released. Its requirements were available for those planning information services before it was completed and may have influenced decisions before it became a requirement. On the other hand, the second version of this standard was formally revised, but news of that revision was not posted to the GILS Forum until months later. Only then was it communicated as an event for the social system, the GILS Forum, although for those who had participated in its development, it was already available as a process.

Moreover, the meaning of each event is shaped by the system observing it. When an information technology business observes the text of a law or information standard, it looks for possible buy/sell opportunities. When the bureaucracy looks at these same communications, it sees binding decisions which function as structures that constrain the work. Consequently, this date-arranged chronology simply presents a context from which to contrast the development of GILS within different social systems.

1940s

This chronology begins with events that occurred in the 1940s, events referenced in a variety of resources, but especially research publications and the histories of particular laws. In 1945, Vannevar Bush developed a description of his ideal tool for organizing information, Memex, a system of linking the references contained in one information source to those being referenced. This was quite different from how libraries at this time were describing information resources–using card catalogs with entries for title, author, and subject.

President Truman established the information service that became the National Technical Information Service in 1945; in 1950 this service became part of the Commerce Department. Congress passed the Federal Reports Act in 1942, designating the Bureau of the Budget (predecessor of the Office of Management and Budget) to manage a paperwork clearance process. According to Congressional testimony, the omissions of this act were corrected by the Paperwork Reduction Act of 1980.

Congress passed the Atomic Energy Act of 1946, establishing the Atomic Energy Commission. This act included the requirement that the Atomic Energy Commission

manage scientific and technical information, in particular the collection, preservation, and dissemination of these resources. In 1947, the Commission established the precursor to the Scientific and Technical Information Service (OSTI), the Technical Information program. Integral to that work was the challenge to organize those resources to facilitate the mission (Office of Scientific and Technical Information, 2001). Personnel associated with OSTI participated in the development of the GILS concept. Congress passed the Federal Property and Administrative Services Act in 1949 which created the General Services Administration and guided the management of Federal property. Congress explicitly included information technology in the Federal Property and Administrative Services Act by its 1965 amendment. These Acts were also updated by the Paperwork Reduction Acts of 1980 and 1995.

1950s

The Federal Records Act and the Budget and Accounting Procedures Act were both passed in 1950. The Records Act gave the General Services Administration responsibility for managing and archiving Federal government records. The second act gave the Bureau of the Budget (and later the Office of Management and Budget) responsibility for statistical policy oversight. The requirements of these two acts, the Federal Reports Act and the Federal Property and Administrative Services Act, were consolidated in the Paperwork Reduction Act of 1980.

The Census Bureau installed an ENIAC computer to manage the processing of decennial census data. Various agencies pooled resources to build shared computer

centers, a pattern that persisted at least into the 1980s and for some agencies beyond (Office of Technology Assessment, 1981).

1960s

As mentioned earlier, the Federal Property and Administrative Services Act was amended in 1962 and again in 1965 when rules for purchasing data processing equipment were incorporated (Office of Technology Assessment, 1981). The 1965 amendment (Pub. L. No. 89-306), also known as the Brooks Act, assigned oversight responsibilities for the purchase of data processing equipment to the General Services Administration and the development of information processing standards to the Department of Commerce (H. Rept. No. 104-37). The Freedom of Information Act, strongly influenced by the 1947 Administrative Procedures Act, was passed in 1966. Both the Freedom of Information Act and the Administrative Procedures Act left implementation decisions at the agency level. Consequently, differences emerged as each agency applied the requirements of these laws within their own organizations (O'Reilly, p. 101).

In 1969, DARPA initiated the standards-development process used to develop ARPANET, the request for comment (RFC). That same year four universities began passing information back and forth on a distributed packet-switching network using the Internet Protocol (IP) (Pasten, 1996, July 13).

1970s

In the 1970s, development work began on the Open Systems Interconnection Basic Reference Model by the International Organization for Standardization (ISO). Building on the networking projects of the Department of Defense and various

universities, NISO established Committee D in 1979 to develop what became the Z39.50 standard. This committee was composed of appointed experts working in isolation to build an information retrieval protocol. At about this same time research libraries and vendors began to develop the Linked Systems Protocol. Participating in this project were personnel from the Library of Congress, OCLC, and the Research Libraries Information Network (Lynch, 1997).

The Office of Management and Budget was created from the Bureau of the Budget by means of Reorganization Plan No. 2 (O'Reilly, 1983). It became responsible for centrally developing and coordinating policies related to administrative regulations developed by executive branch agencies. Congress passed the Privacy Act in 1974, giving the Office of Management and Budget oversight for how government agencies managed the personal information of the public.

By the mid-1970s, as a result of public demand, Congress began investigating ways of reducing the burden of government paperwork imposed by executive branch agencies on the public. The accounting and regulatory burden placed on small businesses received particular attention. Public Law 93-556 established the Commission on Federal Paperwork in 1974. In 1977, the commission, also known as the Grace Commission after its chair J. Peter Grace, issued its report describing the burden the government imposed on the nation. It recommended building a centralized database, a Federal Information Locator System (FILS), which describes the many information collections in enough detail to reveal any proposed information collection requests that duplicated information already available to the government (McDonough, 1993). In 1979, President Carter issued

Executive Order 12,174, mandating just such a database be built by the Office of Management and Budget by April 1, 1982. OMB outsourced this activity to the Department of Defense (OMB Watch, 1996).

1980s

Congress passed the Paperwork Reduction Act of 1980 in response to the Grace Commission reports. This act established within the Office of Management and Budget the Office of Information and Regulatory Affairs. It assigned this office the task of creating the Federal Information Locator System (FILS) and mandated by legislation the OMB responsibility for government-wide[1] management of information policy.

In 1981, Frank da Cruz developed Kermit at Columbia University for transferring files from one computer to another over less than reliable telecommunication lines (da Cruz, 2001). DARPA began to receive technical advice from the Internet Configuration Control Board which in 1984 became the Internet Activities Board. This board met with the International Collaboration Board to cooperatively develop voluntary information technology standards, including TCP/IP, that were international in scope (Crocker, 1993). During this decade TCP was also implemented on ARPANET.

The Reagan Administration (1981-1989), due in part to the guidance of the Paperwork Reduction Act of 1980, emphasized the value of government information, encouraged agencies to sell its information products, and reduced the availability of free government information. In 1982, GPO's legal counsel determined that electronic

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[1] "Government-wide" in this context is limited to the executive branch of the Federal government. It does not include the legislative or judicial branches at the Federal level, nor does it include state, local, or tribal governments.

government information resources were outside the definition for government publications. Consequently, GPO did not distribute these to depository libraries. The following year the Supreme Court ruling in *INS v. Chadha*, brought an end to the ability of legislative committees to veto executive agency policy. As a consequence of this decision, the authority of the Joint Committee on Printing concerning publishing decisions of the executive branch was considerably reduced (Hernon, 1989, p. 398; see also Administrative Conference of the United States, 1984).

In 1984 the International Organization for Standardization (ISO) issued the Open Systems Interconnection Basic Reference Model, ISO 7498, after a cooperative international development process. This model set forth a seven-layer framework for exchanging information by means of a distributed computer network. That same year, the first version of the information search and retrieval standard, Z39.50, designed to function on the application layer of this model, was unsuccessfully balloted by the National Information Standards Organization (NISO) (Lynch, 1997).

The mid-1980s saw several events associated with the legislative and policy work of the federal government. As required by the Paperwork Reduction Act, OMB published in 1985 its guidance on the management of executive branch information resources, OMB Circular No. A-130. A-130 advised agencies to rely on the private sector as much as possible for the dissemination of government information. It also provided rudimentary guidance on a model for Information Resource Management, managing the entire life cycle of government information from collection to final disposition of that information. In 1986 Congress amended and reauthorized the Paperwork Reduction Act.

Throughout the 1980s and early 1990s the way the Office of Management and Budget managed its duties under the Paperwork Reduction Act of 1980 received considerable criticism. Congress held hearings, the General Accounting Office conducted studies, scholars published articles in law reviews and scholarly journals, and the popular media carried several articles. This attention generally fell into two topics, criticism of the paperwork and regulatory review process established by Executive Orders 12,291 and 12,498 and criticism of OMB for its failure to develop and implement the information resource management measures of the Paperwork Reduction Act, including the development of the Federal Information Locator Service.

The House Committee on Government Operations held several hearings to explore how the Federal government could promote a diversity of sources for electronic government information. They issued a report, *Electronic Collection and Dissemination of Information by Federal Agencies: A Policy Overview* (H.Rept. No. 99-560, 1986), recommending easier access to Federal government electronic information for public, private, and nonprofit organizations that might want to acquire and redistribute it. This document was cited frequently in the next few years and contributed to the vision of Congress for the dissemination of electronic government information resources.

Unrelated to these issues, the National Archives and Records Administration was established in 1985. Responsibility for government recordkeeping transferred from the General Services Administration to the National Archives.

In 1986 the government began working on a network protocol based on ISO 7498, the Open Systems Interconnection Basic Reference model. This standard, enhanced

to exchange government information, became the Government Open Systems Interconnection Profile (GOSIP); it was adopted as Federal Information Processing Standard (FIPS) 146 in 1988. FIPS 146 required that by 1990 all computers purchased by the executive branch be GOSIP compliant. Also in 1986 Congress passed the Emergency Planning and Community Right to Know Act of 1986.[2] This act required that the Environmental Protection Agency make available in electronic form information from its Toxic Release Inventory, the first publicly accessible electronic database of government information (Bass and Plocher, 1991, note 56, p. 32).

The Security and Exchange Commission began development of its EDGAR service in 1983 (*Electronic collection and dissemination,* 1986). After several years of availability via private vendors, EDGAR was made available by the SEC via the Internet at no cost to users in the mid-1990s. The Environmental Protection Agency distributed its National Toxic Release Inventory directly to depository and other libraries on CD-ROM in the late 1980s; several other agencies, impressed with the amount of storage space and minimal cost of duplication, were experimenting with CD-ROM technology; the National Agriculture Library distributed time-sensitive information (its EDI program) using private vendors and the news media; and the National Library of Medicine's MEDLARS database was distributed through private vendors. By 1989, it was estimated that 440 electronic databases were available to the public, although there was little done to advertise or index these government resources (see *Federal information dissemination policies*, 1989).

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[2] This act was Title III of the Superfund Reauthorization Act of 1986.

In the late 1980s several Federal government agencies began implementing bulletin board technology to deliver electronic information resources. By 1994 when Bertot and McClure conducted research on them, at least 187 separate bulletin board services were providing a variety of service models (services to anybody or to a select audience, services that did or did not require registration of one kind or another, services that were free or that charged user fees, for example), and none of these was widely known to a general public audience (Bertot and McClure, 1994).

In 1988, the Office of Technology Assessment published an often-cited report, *Informing the Nation: Federal Information Dissemination in an Electronic Age*. This report explored the role of the Federal government, private vendors, depository libraries, and agencies like the National Technical Information Service and the Government Printing Office in the dissemination of electronic information resources (Office of Technology Assessment, 1988).

That same year Z39.50 was finally balloted successfully and published by NISO. Almost immediately implementors began work on a radically revised version of the standard, in part to overcome the shortcomings of the first version, but also to incorporate services for a new audience, the library patron seeking information in abstracting and indexing databases. Over the next couple years Committee D[3] was disbanded and the Z39.50 Implementors' Group (ZIG) was established. In contrast to secretive and closed Committee D, the ZIG was an open group; that is, it was open to a wide variety of people,

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[3] Committee D had been established in 1979 by NISO to begin the early development work that led to Z39.50.

advertised, and supported by an electronic discussion list. The Library of Congress was eventually appointed the maintenance agency for the standard (Lynch, 1997).

In January of 1989, OMB proposed a new revision to its Circular No. A-130 (Office of Management and Budget, 1989) which imposed new restrictions on access to electronic government information resources (see Hernon, 1989; *Federal information dissemination*, 1989). That proposal was withdrawn in April and eventually replaced with a circular that encouraged broad dissemination of government information in electronic formats (online, on disk, on CD-ROM, for example) by Federal agencies. That same year, GPO's legal counsel reinterpreted the 1982 decision concerning the congressional definition of a public document. Following this 1989 decision GPO began to include electronic publications along with the paper and microfiche publications distributed to depository libraries (Hernon, 1989).

Also in 1989, Ed Krol issued RFC 1118, "Hitchhiker's Guide to the Internet," a sometimes irreverent tour for computer-literate people of available Internet services (Krol, 1989). In the late 1980s and early 1990s, many people used Kermit software and a telephone modem to access Internet-based resources. The technologies they used for browsing through those collections of information were gopher and archie.

The Supreme Court decided *Dole* v. *United Steelworkers of America* in 1990. This decision prevented OMB from interfering with agency regulations that required businesses to provide information to audiences other than the government. These were called third-party disclosure notices. Examples of third-party disclosure notices include required text on canned food labels, material safety data sheets, and warnings about hazardous

chemicals or equipment in the workplace. The original sponsor of the Paperwork Reduction Act, Senator Lawton Chiles, filed an amicus brief with the court explaining that the intent of Congress was to *include* such third-party notices in the paperwork oversight process of the Office of Management and Budget; the Courts interpreted the text of the act differently. This decision was often referenced in the debates that led to the 1995 Paperwork Reduction Act (for example, see *Hearing on restraining paperwork burdens,* 1991, p. 10; *The Paperwork Reduction Act and its impact,* 1993, p. 9; *OMB's Office of Information and Regulatory Affairs,* 1994, p. 39).

Beginning in 1989, Congress began an extended process of reauthorizing the Paperwork Reduction Act of 1980. It failed to pass the bill reauthorizing the Office of Information and Regulatory Affairs. In its place, the Bush administration instituted an internal executive office ad hoc committee, the Council on Competitiveness, to manage most of the paperwork clearance functions of the Office. This committee, chaired by Vice President Dan Quayle, generated criticism for its secretive processes.

1990s

As Congress and the administration re-emphasized electronic information, depository libraries faced a new challenge: providing access to that information. This task required purchasing computer equipment and developing and applying technical expertise to make these resources available to clients. The GPO General Counsel, Anthony Zagami, determined that depository libraries may not charge clients for the costs associated with providing access to government information in electronic formats, excluding that possible avenue for funding technology purchases (Zagami, 1991; McClure, Ryan, & Moen, 1992).

Congress passed the High Performance Computing Act in 1991 which called for the establishment of the National Research and Education Network (NREN). It encouraged research on high-speed networks and connecting higher education institutions to the developing Internet.

By June of that year, libraries and other institutions had made 30 searchable databases available on the Internet using technology that complied with the ANSI/NISO standard, Z39.50 (Perritt, 1992). The Z39.50 Implementors' Group balloted version 2 of the Z39.50 standard. The developers also began work on implementing Z39.50 on TCP/IP by means of the Z39.50 Testbed project, a project which was not completed until 1993. Work also began in the International Organization for Standardization on ISO 10162 and 10163. Eventually these two standards and Z39.50 would merge into ISO 23950.

In January of 1992, the Internet Society was formed. It folded into itself the Internet Activities Board (formed in 1984 from a DARPA organization, the Internet Configuration Control Board) and renamed it the Internet Architecture Board. The Internet Society monitored Internet standards developed by the Internet Engineering Task Force (IETF). The IETF included network designers, vendors, researchers, and network operators from around the world. Its membership was open to any interested parties (Crocker, 1993; Internet Engineering Task Force web site, http://www.ietf.org/overview.html).

The Information Infrastructure Task Force issued the report, *National Information Infrastructure: Agenda for Action* (1993). This often-cited report included a vision for a government information locator, a vision that fit in part with the capabilities of

ANSI/NISO Z39.50- 1992, but that also demanded more than Z39.50 could deliver (Moen & McClure, 1994, section 7.2; see also Information Infrastructure Task Force, 1993).

The Information Infrastructure Task Force hosted an E-Media Conference to showcase agency projects designed to distribute government information on the Internet in November, 1993, and began plans for a second conference in January (Information Infrastructure Task Force, December 13, 1993). It was at this time that cutting edge developments for users of the Internet were described in such communications as Mitch Kapor's *Big Dummy's Guide to the Internet* in 1993 and Scott Yanoff's email periodical publication, *Special Internet Connections* (1994). These publications described an internet that contained no hyperlinks, no graphics, no buying or selling, no advertisements, no music, no chat, and no search engines.

That year Congress passed Public Law 103-40, the Government Printing Office Electronic Information Access Enhancement Act of 1993. By April the next year, a Wide Area Information Server (WAIS) was implemented using Z39.50- 1992 (Moen and McClure, 1994), and the next month, the Government Printing Office introduced its online service, GPO Access, providing the full text of the *Federal Register* and the *Congressional Record* using the first version of WAIS.

The Office of Management and Budget issued further revisions of OMB No. Circular A-130 (1993), further updating guidance to agencies concerning both information resource management and dissemination of government information resources to the public. This guidance was set into law by the Paperwork Reduction Act of 1995.

The U.S. Census Bureau made its first Internet site available for use with Mosaic software in September of 1994 (Information Infrastructure Task Force, 1994-1995), and the Fish and Wildlife Service established its first Web server in November of that year (Fisher, A.R. (1994, August 27) Subject: National Wetlands Inventory World Wide Web Server).[4] Netscape Communications developed the popular Mosaic software into Netscape 1.0. They released it in early December 1994 and changed how people experienced the Web (Ferrill, 1994; Jerram, 1995).

SOLINET, a regional library consortium, received a grant from the National Telecommunications and Information Administration (NTIA) and began in 1995 to develop a southeast regional locator for online resources for economic development, a project that crossed levels of government, agency mission boundaries, and political boundaries. The implementors explored the use of GILS as a means of describing and providing search and retrieval services for this regional project (Belton, K. (February 8, 1995) Subject: State GILS initiatives).

The first two weeks of May, 1995, the Office of Management and Budget and FedWorld hosted a two-week Electronic Open Meeting (National Telecommunications and Information Administration, 1995). Its purpose was to provide the general public and vendor communities opportunities to participate in the development of future Internet initiatives. The invitation to participate was distributed widely in electronic form and accompanied by an extensive bibliography which was described as relevant to the project.

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[4] Messages from the GILS Forum are referenced in many places in this dissertation. These references include the name of the poster, date of post, and subject. Individual messages are not referenced in the bibliography.

Also in 1995 a few vendors offered software implementing WAIS Z39.50 server. One of those was Fulcrum Technologies which offered its Surfboard technology to Forum readers (Doyle, M. (August 3, 1995) Subject: GILS Compliant Database–Fulcrum Softboard; and Christian, E. (July 20, 1995) Subject: GILS Subgroup/ July 18 Minutes).

Public access to Federal government information expanded to include thousands of Judicial Branch publications in September of 1996 with the release of the Federal Legal Information Through Electronics (FLITE) system. This system contained over 7,000 Supreme Court opinions dating from 1937 to 1975 (Weiss, P. (September 24, 1996) Subject: FLITE–Some of you might be interested). The next month the President signed into law the Electronic Freedom of Information Act Amendments of 1996. This act required that agencies make public an index of all agency information, a description of their locator systems, and a Freedom of Information Act (FOIA) handbook in both paper and online. The next April, OMB issued Memorandum 97-10, providing guidance to agencies concerning the implementation of this law.

In January of 1999, the Directorate-General dealing with telecommunications and information policy of the Commission of the European Communities issued a "Green Paper" on "Public Sector Information: A Key Resource for Europe." This paper argued for European Union policies that ensured the availability of government information. The paper cited the U.S. Federal government model of open, low-cost access to government information. It referenced FOIA, the Paperwork Reduction Act, OMB circulars, and GILS. The paper was described as signaling a sea-change in how European Union governments managed their information resources. Past practice considered the economic

opportunity of copyrighting and selling government information (Christian, E. (February 3, 1999). Subject: The EC gets religion? (fwd)).

Eliot Christian, who was involved in the development of GILS from its earliest days, announced in 2000 the launch of the Government's information clearinghouse, called Access America. This project was developed in 1999 by leaders from the U.S. Federal Chief Information Officers Council, the National Partnership for Reinventing Government, OMB, and the General Services Administration among others. This initiative did not have a legislative mandate, but it was developed by a collaboration of technical staff from several agencies (Christian, E. (February 29, 2000) Subject: Government Information Clearinghouse). This year also saw the establishment of FirstGov (http://firstgov.gov), a search engine and web site that provided access to Federal and State government information (Bhambani, 2001).

Part 2: FILS

GILS was developed during the 1990s along with the communication systems and legal framework that affected it. Before describing the development of GILS, it is important to observe more carefully its predecessor, the Federal Information Locator System (FILS). This system was recommended by the 1977 Commission on Federal Paperwork and required by the Paperwork Reduction Act of 1980. Its place in the law, 44 U.S.C. 3511, is exactly where the Paperwork Reduction Act of 1995 put the requirements for GILS. The law requiring its establishment shared the same legislative history (the same constellation of related and influencing laws) as the law requiring the establishment of GILS. The description of the development of GILS will be enriched by observing the

development of the Federal Information Locator Service. This part of chapter 5 begins with a chronology of communications, then ends with a theory-based exploration of those communications.

FILS Chronology

In many ways the FILS is the precursor to GILS. Its purpose was described by the Commission on Federal Paperwork Commission in its 1977 report, *The Federal Information Locator System: A Report of the Commission on Federal Paperwork* (p. 1):

> The Commission recommends the development of an inventory of these public reporting requirements. The inventory would be a single, authoritative register of all Federal reporting imposed on the public. Much like a catalog or index used in libraries, subject terms describing the general contents of these reports would be used to:
>
> - identify duplication in existing or new reporting requirements;
> - locate existing information that may meet the needs of an agency and thereby promote sharing to avoid duplication;
> - provide a central coordinating mechanism for Federal, State and local government requirements for information;
> - maximize the use of information by identifying available information for Congress in drafting legislation and information for the executive branch in operating programs; and
> - make visible public burdens from this reporting so that effective action can be applied to reduce these burdens.

It was intended to be an index that agencies could use to identify information already available from other agencies. It could also be used by governments at all levels as a finding aid to determine what information was needed for the functioning of government. If it had already been collected, it was then not necessary for agencies to gather this information again from the public. The vision of the Commission was of a

system that was central to the information management functions of the agencies, a system that automated and integrated information to benefit both government and public access.

In the years between the Commission recommendations and passage of the Paperwork Reduction Act of 1980, the Office of Management and Budget established a task force that developed a rudimentary prototype Records Management System (RMS). They used the Department of Defense locator system, the Information Requirements Control Automated System (IRCAS). After 18 months of operation, the task force issued its report on the viability of the system for revealing duplicate paperwork requests. Of the 35 agency regulatory reports submitted to the RMS, it failed to find any duplicate reporting requirements (reported in Bass and Plocher, 1991, note 10, p. 30). This report also made recommendations for a more intricate system, one that might better accomplish the more complex vision of the Paperwork Commission. The Task Force recommended to OMB that it develop a distributed system, described as follows (note 11, p. 30):

> a computerized information system application where data residence and software functioning is split between a central computer and one or more remote sites, thereby sharing the workload and permitting more flexible, localized control; e.g., data may be entered on a remote mini computer which validates and edits the input; some of the data is used to update files stored only on the mini and used by users at the local site; data to be shared among many users must be processed by the central computer, and is interchanged by a telecommunications link.

In 1980, Lawton Chiles shepherded H.R. 6410, the Paperwork Reduction Act of 1980, through the 96th Congress after carefully laying the groundwork[5] for this legislation in preceding years. According to its official summary, the act was intended "To reduce

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[5] O'Reilly describes that groundwork as including the establishment of the Paperwork Commission and the reports they produced (1983, p. 112, note 142).

paperwork and enhance the economy and efficiency of the Government and private sector by improving Federal information policymaking, and for other purposes" (94 Stat. 2812). It amended the Federal Reports Act and establishes within the Office of Management and Budget (OMB) an Office of Information and Regulatory Affairs and required the establishment of a Federal Information Locator System (FILS) as recommended by the Commission on Federal Paperwork (1977). Here is the text of the law relating to FILS:

> Section 3511: Establishment and operation of Federal Information Locator System
> (a) There is established in the Office of Information and Regulatory Affairs a Federal Information Locator System (hereafter in this section referred to as the 'System') which shall be composed of a directory of information resources, a data element dictionary, and an information referral service. The System shall serve as the authoritative register of all information collection requests.
> (b) In designing and operating the System, the Director shall--
> (1) design and operate an indexing system for the System;
> (2) require the head of each agency to prepare in a form specified by the Director, and to submit to the Director for inclusion in the System, a data profile for each information collection request of such agency;
> (3) compare data profiles for proposed information collection requests against existing profiles in the System, and make available the results of such comparison to--
> (A) agency officials who are planning new information collection activities: and
> (B) on request, members of the general public; and
> (4) ensure that no actual data, except descriptive data profiles necessary to identify duplicative data or to locate information, are contained within the System.

As with the FILS concept described by the Paperwork Commission, Congress intended that this technology function as the central mechanism for preventing duplicative information requests. It also was intended to be used for providing information to the public (see Section 3511(b)(3)).

President Reagan issued two executive orders that largely determined how OMB would implement the Paperwork Reduction Act, Executive Orders 12,291 (1981) and 12,498 (1986) providing Administration[6] guidance for paperwork reduction and regulatory review. As reported in 1989 by then Director of OMB, Jay Plager, the agency considered the review of regulations and the paperwork requirements associated with them largely impossible to separate from its information management duties. According to Bass and Plocher, because of their primary attention given to these executive orders, OMB ignored the far more complex vision of the Commission on Federal Paperwork and the Paperwork Reduction Act for FILS (Bass and Plocher, 1991).

Congress conducted many oversight hearings concerning OMB's implementation of the Paperwork Reduction Act. For the most part, these hearings were contentious and critical of the regulatory review process. As early as October of 1981, William Bowsher of the General Accounting Office[7] reported having difficulties working with OMB, and he delivered a report critical of their management of FILS. In spite of having received recommendations from the Paperwork Commission and its own Task Force, OMB had made no progress. Funding for the project was doubtful and OMB had not yet hired a

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[6] I have capitalized the word Administration to reference the colloquial meaning of the term; that is, the Executive Office, here the Republican President and other Republicans in government. This distinguishes this political term from the theoretical concept associated with Luhmann's administrative sub-system.

[7] The General Accounting Office functions as a non-partisan investigative agency for the legislative branch of government. However, it is influenced by the political and administrative interests of the majority in Congress. Consequently, its relationship to executive branch agencies, including OMB, was at that time intensely charged with concern for the balancing of powers of the separate branches of government.

manager for FILS (*Implementation of the Paperwork Reduction Act of 1980 (Public Law 96-511)*, p. 17-18) Bowsher had seen the Department of Defense system established during the Carter Administration and described it as very helpful. Bowsher expressed confidence that the only way OMB could identify duplicate data elements in the 5,500 separate requirements currently in its inventory was by using FILS (p. 48). During the same hearing and at several subsequent hearings, Eugene Hardy, chairman elect of the Business Advisory Council on Federal Reports,[8] continued to urge action on FILS. He reported that his organization stood ready to advise OMB in this task (p. 101, 113) (See also *The Federal paperwork burden*, 1981; *Implementation of the Paperwork Reduction Act of 1980*, 1982; *Oversight of the Paperwork Reduction Act of 1980*, 1983; *Paperwork Reduction Act Amendments of 1983, H.R. 2718)*, 1983; and *Paperwork Reduction Act Amendments of 1984*, 1984).

Speaking for OMB, Edwin Harper reported that Dr. James C. Miller, Administrator of OIRA, was recruiting a professional manager for FILS and that the agency had an operational Records Management System composed of records built on a data profile about each information collection (p. 116). He reported that they had revised the system to more closely meet the requirements of the Paperwork Reduction Act. It needed both a keyword index and a data element dictionary, and both of these would

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[8] The Business Advisory Council on Federal Reports was an organization representing business interests. It was formed in 1942 at the request of the President to assist government in implementing the Federal Reports Act (*The Federal paperwork burden: Identifying the major problems*, 1981, p. 11).

require time and money to build (*Implementation of the Paperwork Reduction Act of 1980, Public Law 96-511*, 1981, p. 131, 135).

In April of 1982, Christopher DeMuth reported that OIRA had identified 19 information collections that would have been duplicative in the past 11 months. They discovered that agencies knew some information has already been collected by other agencies, but they reported that it was unavailable to them because of issues of confidentiality or legal and administrative restrictions. He noted that FILS could not solve this problem, that what was needed was greater interagency sharing and extended protection for confidentiality. He reported to the committee that OMB had concluded an agreement with the Department of Defense to manage FILS using its IRCAS system and that he expected the FILS prototype to be functional by fall (*Implementation of the Paperwork Reduction Act of 1980*, 1982, p. 4; see also Bass and Plocher, 1991, p. 15). During this same hearing, William J. Anderson of the General Accounting Office reported that although OMB had hired a project manager in December of 1981 and was making progress toward implementing a fully operational FILS by October, it had failed to meet the requirements of the Paperwork Reduction Act (p. 53, 71).

In April, 1983, Bowsher delivered a General Accounting Office (GAO) report on FILS. He reported progress, although FILS was behind schedule. He expected it to be operational by October of 1983. Joseph Wright of OMB provided more details: FILS was in the prototype stage; a 14 agency steering group was contributing to it; it was online, useable already, and should be fully implemented by the end of the fiscal year (p. 49, 50,

75). He provided an estimate of money already spent to develop FILS (*Paperwork Reduction Act Amendments,* 1983, p. 68):

OMB	$43,000.00
DoD	75,716.95
Agencies	131,200.00 (obligation for FILS access)
Agencies	86,600.00 (estimated expenses)
Total:	$336,516.95

In 1983, the Department of Defense upgraded FILS to the Defense Information Automated Locator System (DIALS), a system operated by a private contractor, American Management Systems (AMS). The system contained only reports of information collected from the public. It did not include plans for public access or indexing other agency information resources (p. 15). In April, OMB announced that FILS was available for all agencies and the General Accounting Office to use. In October of that year, the National Bureau of Standards Institute for Computer Sciences and Technology reported that moving FILS to DIALS improved its operation, but that keyword searching could be improved if users employed the GAO Thesaurus. They also recommended that OMB establish ongoing updating procedures (Bass and Plocher, 1991, p. 16).

In May 1983 Christopher DeMuth of the Office of Information and Regulatory Affairs, testifying before a Senate committee concerning industry-wide paperwork burdens, reported that the "information locator system, which we have just established a pretty good prototype model of and which is in operation [sic], provides us with this crosscutting capability that we have never had before" (*Oversight of the Paperwork Reduction Act of 1980,* 1983).

A year later DeMuth reported that FILS was fully operational (*Paperwork Reduction Act Amendments,* 1984, p. 25) and beginning in June 1984, OMB would require all major agencies to search FILS for duplicate paperwork requests. Smaller agencies would be invited to use FILS. He speculated that they may not be able to eliminate much duplication because of statutory and programmatic constraints.[9] Moreover, they had found few duplications of paperwork collection (p. 36; see also Bass and Plocher, 1991).

After the issuance of OMB Circular No. A-130 (1985) which provided the executive branch of government guidance on managing information and the technology associated with it, Congress began to investigate the concept of electronic government information resources as *public* information resources rather than *agency files.* Several hearings were held by both Senate and House committees, and the House Committee on Government Operations produced *Electronic Collection and Dissemination of Information by Federal Agencies: A Policy Overview* (1986). This report explored the strategies being developed by executive branch and independent agencies for making electronic information available to the public. They extended to electronic government information several concepts applied more or less routinely to government information disseminated as paper documents. These included avoiding monopoly control, copyright-like policies that limited access, and pricing beyond the marginal cost of dissemination. They recommended making government information in electronic forms available to the

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[9] Examples of constraints here are those in the Privacy Act requiring agencies to ensure that information about individuals be kept strictly confidential.

public using systems developed with early and frequent consultation with potential public users. They warned that the relations developed with private vendors should not result in either direct competition with them or monopoly control by any one vendor. They envisioned government databases that were available to the public and sold to vendors who provided expanded, value-added features such as market analyses developed from Securities and Exchange data.

Their conclusions were developed by listening to agency personnel, vendors, and public information users in congressional hearings, by analyzing the legislation related to government information policies, noting the findings of General Accounting Office investigations, observing various agency endeavors to develop and make available electronic information resources, noting scholarly research in the field, and by investigating court decisions.

Their arguments began with and moved *from* legislation as foundational *to* these other resources; the laws provided the starting assumptions for their arguments and constrained their assessment of other communications, whether an agency proposal complied with the requirements of the Printing Act, the Copyright Act, or the Privacy Act and whether a court decision interpreted rightly the intent of Congress (*Electronic collection and dissemination,* 1986). This report is cited frequently in Congressional hearings as shaping the *ideals* for how government information *should* be made available to the public.

Congress reauthorized[10] the Paperwork Reduction Act for another three years in 1986. It amended the act by requiring Senate confirmation of the Administrator for the Office of Information and Regulatory Affairs, setting deadlines for information resources management initiatives, appointing a chief statistician, requiring public disclosure of the regulatory review process, limiting the use of appropriations for OIRA to functions specified under the Act, and adding new emphasis on disseminating information via electronic means (see also Senate Report 104-8, p. 24, 26, and 59).

In 1988, OMB ended its agreement with the Department of Defense, reporting that their collaboration "accomplished its original purpose." OMB began using its own system, still called the Reports Management System (RMS) and began to make plans to provide telecommunications-based access for public users (Bass and Plocher, 1991, p. 17). By 1989, however, Jay Plager (Director of the Office of Management and Budget) reported to a Senate subcommittee that when the Office of Information and Regulatory Affairs received proposed forms from agencies, desk officers routinely distributed them to other agencies as a strategy for ensuring that the required information was not already available. They were not using FILS to ensure against possible duplication of paperwork (*Implementation of the Paperwork Reduction Act,* 1989, p. 80-81).

The need to reauthorize the Paperwork Reduction Act in 1989 increased Congressional interest in the work of OMB and in strategies to bring OMB implementation into closer alignment with Congressional intent. Major Owens, who was a

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10 Reauthorization of the act involved authorizing funding for the operations of the Office of Information and Regulatory Affairs that related to paperwork reduction work.

librarian before he became a Representative, testified in a committee hearing concerning the Federal Information Locator System. He cited his own respect for the expertise needed to index information resources. He recommended new management for the system that drew on the expertise of the library community *(Reauthorization of the Paperwork Reduction Act*, 1989, p. 505-506):

> I recommend that the Federal Library and Information Center Committee be given the responsibility to coordinate the Federal Locator System and that within that system certain agencies be given specific responsibilities. The Superintendent of Documents should continue, in cooperation with the Library of Congress and Federal agency libraries to index and catalog all Government publications, regardless of format. The Federal Library Committee should coordinate access to these two data bases through cooperative agreements among all FLICC members. The indexing standards for these data bases should be established by the Federal Library and Information Center Committee, with input from the library community. Agency librarians should be given the responsibility and the power to acquire and provide their agency's Government publications to the Superintendent of Documents, the National Technical Information Service and the Educational Resources Information Center for indexing and distribution. We should concentrate on improving it instead of dramatically changing it.

Frank Horton, who had served as chair of the Commission on Federal Paperwork in the 1970s, asserted that the Federal Information Locator System existed largely in name only (*Reauthorization of the Paperwork Reduction Act*, 1989, p. 5). He reported that OIRA planned to make FILS more available to the public. The Office of Information and Regulatory Affairs distributed it through the Government Printing Office to depository libraries in microfiche and made it available through the National Technical Information Service in paper, fiche, and on diskette (p. 612). Whatever the format, however, this file did not describe internal agency documents, shared reporting information, publications, or

archived information. It was not fully searchable, nor was it accessible to other agencies or the public (Bass and Plocher, 1991, p. 17).

The report accompanying Senate Bill S. 1742, the Federal Information Resources Management Act of 1990 (S. Rept. No. 101-487, 1990), offered a review of House and Senate analyses of the implementation of the Paperwork Reduction Act of 1980. In reference to FILS, the authors report that

> FILS has been described almost exclusively as a method to detect paperwork duplication. . . . Despite considerable resources devoted to the development and operation of FILS, OIRA can not identify major uses of the FILS which have resulted in reducing unnecessary or duplicative paperwork. . . . Improvements in information technology have made the prospects of automated information directories much more realistic. It is no longer far fetched to begin planning for a system or set of systems that would allow agencies as well as the public to have varying degrees of access to information about government information holdings.

The authors of this report described two basic purposes for a refined FILS. First, FILS will help both agencies and the public identify the kinds of information collected by agencies, and second, FILS will assist agencies and the public in locating public information systems, products, and services. They expressed hope that new technological developments would make the implementation of this refined FILS much more useful.

In 1990, a team of researchers (McClure, Bishop, Doty, Bergeron, and Pierrette, 1990) conducted a study of FILS. This study was funded by the General Services Administration and OIRA. It identified various agency systems that functioned like information locators, identified policy documents related to FILS at both the agency level

and at OMB, and evaluated FILS. The researchers identified several stakeholders[11] for FILS. They concluded that

> There is general agreement [among these stakeholders] that the existing Federal Information Locator System (FILS) is an ineffective tool for providing access to government information, that a new or revised system is needed, and that specific criteria that might serve as the basis for such a system can be identified. Perhaps most importantly, there is wide agreement across the various stakeholders that some form of an inventory/locator system for government information is both desirable and feasible (McClure, et al, 1990, p. 1).

They concluded that FILS could not be taken as a government-wide inventory/locator system. It did not meet its objectives, did not provide adequate access to government information, and provided little assistance in measuring paperwork burden or reducing duplication of paperwork (p. 8). The researchers reported widespread interest in developing locator records based on standardized record design (p. 57). This report began the development of a revised FILS and renamed the locator as the Government Information Inventory/Locator System (GILS). According to James Blumstein, nominee for the position of Administrator of OIRA in 1990, OMB agreed that FILS did not accomplish what was intended (see *Nomination of James Blumstein,* 1990, p. 101-102) and considered this McClure report the beginning of a phase of reassessment and reappraisal (p. 101).

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[11] They identified these groups as stakeholders: Federal mission agencies, Federal information dissemination agencies, OMB-OIRA, Congress, Public advocacy groups, the library/information science community, the general public, and the private sector (p. 1).

Gary Bass of OMB Watch[12] and David Plocher, who worked for several years as a staff member for the Senate Committee on Governmental Affairs, collaborated to write a history of FILS and recommendations for a more functional FILS. They concluded that FILS was never fully implemented. They develop the argument that OMB never understood the original vision of the Federal Paperwork Commission, a vision that was broader than simple regulatory paperwork management. They also criticized the McClure study team for its limited vision of government information that should be available through FILS. The McClure team focused attention on published, disseminated public information. Bass and Plocher envisioned a FILS that, like the original vision of the 1977 Paperwork Commission, provided access to both disseminated publication-like information and government files, reports, databases–essentially, government information at any stage of its life cycle from initial collection to its archiving or destruction (Bass and Plocher, 1991).

These two reports along with the legislative hearings of 1989 and 1990 mark a fuzzy kind of transition between FILS and what would become the Government Information Locator Service. Bass and Plocher describe the work of the McClure team as "reinventing the wheel" (p. 18). McClure, et al., considered FILS a failure and began the development work for a new system. Later research reports by McClure-led study teams and legislative efforts looked toward a newly-designed system that took advantage of

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[12] OMB Watch is a public interest group that pays particular attention to the work of the Office of Management and Budget.

computer networks and new database technologies (McClure, Ryan, & Moen, 1992), (Moen & McClure, 1994).

Theoretical Reflections on FILS

To consider the development of FILS by means of Luhmann's social systems theory, one must observe communications by means of distinctions. The political system is distinct from its environment which includes other social systems. It differentiates within itself three sub-systems, politics, the administrative, and the public (Luhmann, 1982). One might also observe communications of science, economics, education, or the legal system here as well. The communications considered by this researcher were for the most part those of Congress: laws, testimony in published hearings, congressional reports, assessment reports of the General Accounting Office, and similar documents.

The communications of all three political sub-systems can be distinguished in the testimony from the hearings. Political persons represent a political party (either the majority or the minority), and develop the party line on a topic as they communicate. Administrative work develops as members of Congress, their staff, and agency personnel describe their proposed legislation. The public sub-system is represented by communications about public opinion. While the communications of business people and librarians and researchers can be understood as communications within the public system, they can also *at the same time* function as communications within the economic system, education, and science. They voice their opinions about a proposed piece of legislation or the consequences of an act of Congress. They may express them as "the effect on my business" or the impact on educational programs or academic research.

The Political Sub-System

Congressional hearings are a rich resource for exploring the communications of the political system. Legislators generally make statements that represent and continue the development of the party line. The 1980 elections brought a Republican President, a Democrat-dominated House, and a Republican-dominated Senate to Washington. Democrats throughout the 1980s were highly critical of the decisions of the Republican Reagan Administration in reference to the implementation of the Paperwork Reduction Act. They supported continuing availability of government information products to the public. They described these as resources for making the (Republican-dominated) government "accountable to the public." The Republicans, faced with a growing deficit and budgetary constraints, made decisions about agency publications that reflected both the party's "war on waste" and efforts to improve the "efficiency and economy" of government. These phrases in quotation marks function as coded language and represent extended arguments of the two parties. They represent party objectives. Party members spoke in agreement with these party objectives. The differences between the parties affected both the kinds of problems visible to government and the kinds of solutions available to government.

Democrats charged the executive (Republican) branch agency, the Office of Management and Budget (OMB), with interfering with agency missions, with interfering with regulations designed by agencies (under the direction and oversight of Congress with its Democratic-majority House) to protect the public. These charges distinguish for the public the character of Democrats in contrast with the character of Republicans:

Democrats protect the public; Republicans encourage economic growth–more coded language.

As an agency within the executive office of the President, OMB was designed to provide management of the executive branch agencies. On the one hand it reflected the agenda of the current Republican administration; on the other hand, it was subject to the oversight of Congressional committees like the House Committee on Government Operations (controlled by a Democratic majority) and the Senate Committee on Governmental Affairs (controlled by a Republican majority). The House committee was immediately and stridently critical of the implementation work of OMB.

OMB decided to develop FILS using the budgetary and technological resources of the Defense Department and other agencies rather than requesting separate funding which would have cost Republicans political capital (Bass and Plocher, 1991, p. 15). Congressional Democrats then framed their response in terms of political priorities: information resource management initiatives like FILS were not priorities for the Republicans.

The Administrative Sub-System

A Democratic Congress and President had put in place the requirements of the Paperwork Reduction Act of 1980 just after the Republicans won the presidency and a majority in the Senate in 1980. That law imposed on government requirements to create FILS and to develop government-wide information resource management strategies by means of a newly-created agency within the Office of Management and Budget, itself a part of the Executive Office of the President.

The Reagan Administration, perturbed by a deficit budget, the requirements imposed on the executive branch by the opposition party, and its perception of public opinion, crafted a strategy for managing its day-to-day operations. Reagan, using executive orders, developed a process for managing both paperwork reduction efforts and the regulatory review process by the same operations. Their argument generally followed these lines: What generates information? Paperwork. What generates paperwork? Regulations. How does government control regulations? Regulatory review. Thus regulatory review–of necessity–also accomplishes management and oversight of government information. This logic both grew from and shaped the expectation of OMB personnel that government could improve efficiency of its information management processes by careful oversight of and control over the kinds of information it collected from the public. Consequently, the same duty officers concerned with reducing paperwork reviewed regulations and merged the two objectives in their management processes. They provided executive branch agency personnel feedback on a day-to-day basis about information management.

Consider again the Democratic charges that OMB interfered with agency missions by interfering with regulations designed by agencies (under the direction and oversight of Congress with its Democratic-majority House) to protect the public. As administrative development work, these charges identify problematic processes in place and explore strategies for solving those problems. Several hearings from the early 1980s included questions from congressmen about how OMB conducted its work and answers from OMB personnel describing that work. They also include references to General Accounting Office

studies of OMB operations–how OMB conducted its work, how open OMB operations were made available to public review, whether OMB was influenced unduly by members of the public, whether OMB was responsive to the protests of suffering members of the public, and so forth.

The Office of Management and Budget frequently reported progress and success in these hearings. They reported progress with implementing the FILS and early satisfaction with its functionality. They reported considerable success with reducing the burden imposed on the public by government reports and forms,[13] reducing both the number of forms and the complexity of remaining forms, including their contribution to the development of the IRS 1040EZ form (which can also be observed as a political communication–a Republican success story), for example.

The Public Sub-System

The public, represented by business people, librarians, public watch-dog groups, and others testifying in hearings, reported to Congress about their concerns. Business people described the effect of regulations and paperwork on their economic viability. Librarians reported on the much-reduced flow of government publications to depository libraries and on the need of students and scholars for access to that information. Public watch-dog groups argued for openness and more efficient Freedom of Information procedures.

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[13] This burden was measured in the number of hours agency personnel estimated would be needed to complete a government form. These estimates were themselves politically controversial and subject to the challenges of both economic and scientific communications.

Observations in the Environment of the Political

The library community approached the problem of FILS from a perspective different from that of Congress. Libraries organize and store publications, making them available to their clients. Traditionally librarians worked not so much with agency records, but with government information that was organized and prepared for publication.[14] In spite of this attention to publications, librarians lobbied Congress for access to government information in electronic formats which in the 1980s were often considered to be agency files. They were aware that their clients used electronic information resources in new and powerfully different ways from paper resources.

They respected the value of electronic indexes, having experienced in many libraries the effect of transforming the card catalog into an electronic database. Their experience with government information was largely by way of the Depository Library Program. Managed by the Superintendent of Documents within the Government Printing Office, this program distributed to about 1500 libraries across the nation the publications of the Federal government. Librarians expressed little interest in the collection requests indexed by FILS.

Unlike the mass media and other organizations, librarians did not find the Freedom of Information Act useful for the kinds of transactions that took place in libraries, where a client sought information and expected nearly immediate satisfaction. Libraries did not have the time, nor did they have the resources to fight extended legal FOIA battles (note

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[14] See Bass and Plocher, p. 19. Moen identifies the library paradigm of resource description and discovery as the model on which the Government Information Locator System was based (Moen, 2001, p. 156).

the testimony of librarians Harold Shill, Kaye Gapen, and Nancy Kranich, *Federal information dissemination*, 1989).

The difference between the interests of librarians (published resources) and congressional oversight personnel (agency information resources) is significant. The work of Congress involved oversight of agency operations; access to agency files might make transparent the walls separating agencies from each other and from their Congressional oversight committees, might make visible to agencies the information already collected by other agencies, and might make visible any subterfuge initiated by agency personnel testifying before those oversight committees.

The work of libraries involves organizing and making available information for diverse clients. Some information resources are transitory and time-sensitive. These include such information as current economic and business statistics, press releases, and announcements of short-term funding opportunities. While valuing time-sensitive government information, however, many librarians are also responsible for preserving government information indefinitely. Early census reports, 19th century Smithsonian bulletins and annual reports, the Serial Set of Congressional publications and many more documents are highly valued for their historically significant content. Locating the particular information contained in the vast collections of many depositories requires the use of specialized indexes, indexes like the *Monthly Catalog of United States Government Publications*, required by an act of Congress to be produced by the U.S. Government Printing Office.

Indexes in libraries, then, traditionally function to locate in space (on the shelf) particular publications, which have for centuries been almost entirely composed of ink on paper. Brown and Duguid (2000) describe the print publication as a technology that "attaches information to things, bridging the world of information and material objects" (p. 182). Not only does a publication attach information to a material object, it also interprets, validates, and testifies to the authority of its publisher. "Physical heft lends institutional weight to what it says" (p. 187). Thus, a collection of government publications presents both information to the user and a representation of the institution that produced it. Indexes make large tangible collections manageable; collections represent and present to library users the institutions that produce the volumes.

FILS was intended (observed as administrative communications) by the Commission on Federal Paperwork to work as a different kind of index. As its legislative mandate indicates, FILS was to be composed of "a directory of information resources, a data element dictionary, and an information referral service. . . [which] shall serve as the authoritative register of all information collection requests" (44 U.S.C. 3511, 1980). Rather than describing publications, FILS was intended to describe information at any and every stage of the information life cycle. The stages of that life cycle were defined as the collection, processing, storage, and dissemination (and ultimately retention or archiving) of information (Office of Technology Assessment, 1988, p. 8). As an index of data elements, it was intended to allow agencies to track down information already collected by other agencies. It was to make the information within an agency apparent to other

agencies (for the sake of reusing the information) and to Congress (for purposes of Congressional oversight).

The ideal for this index, however, was frustrated by the unforseen complexity of the project. The Privacy Act and other acts of Congress prevented some agencies from sharing information even with other governmental agencies (*Implementation of the Paperwork Reduction Act,* 1982, p. 4). Title 13, section 9 of the U.S. Code specifically prohibits the Census Bureau from sharing its data in any way that might reveal the identity of an individual.

Another barrier to sharing information from agency to agency was the different ways agencies needed particular information. For example, the question, "How old are you?" can be answered in many ways, as Birthdate: mo/da/yr (and many other ways of formatting that date); Year of Birth: yy or yyyy; or Age: a particular number or a range of numbers (15 to 24, 25 to 40, and so on). Matching these answers in an electronic index or applying them in support of the purposes of an agency mission proved to be very complex (Bass and Plocher, 1991).

Not only do librarians and others mean different things when they speak of indexes of government information, the idea raised Constitutional concerns which can be observed as legal system communications (although they may also be observed as political and administrative communications). Representatives Owens and Bates emphasized during a committee hearing the long-standing responsibility of the Government Printing Office, a legislative body, to index publications of the Federal government. That responsibility was established by the Printing Act of 1895. Were this responsibility and the establishing of

printing standards (also traditionally the duty of the Government Printing Office) to be assigned to the Office of Management and Budget by amendments to the Paperwork Reduction Act, the likely result could have Constitutional balance-of-powers implications (*Reauthorization of the Paperwork Reduction Act,* 1989). The tension between the Constitutional issues of Congressional oversight and executive branch management and budgetary and regulatory control was a concern throughout the 1980s (see, for example, *Paperwork Reduction Act Amendments,* 1983; *Electronic collection and dissemination,* 1986; Hernon and Relyea, 1995; and Administrative Conference of the United States, 1984).

In 1990, the Senate produced a conference report (Senate Report No. 101-487, 1990) on a proposed reauthorization of the Paperwork Reduction Act. The authors of this report included a statement of the failure of FILS:

> While the aim of FILS has been to have consistent data in one system on every question asked by the Federal government on every information collection instrument in a manner that can be cross-referenced, this is a difficult technical task. Additionally, OIRA has become convinced that there is actually relatively little duplication that would be caught by such a system. Not that there are not overlapping collections, or needless questions, or overly burdensome collections, but a single automated system cannot be developed that can identify such duplication. Despite considerable resources devoted to the development and operation of FILS, OIRA can not identify major uses of the FILS which have resulted in reducing unnecessary or duplicative paperwork.

Thus, Congress expressed the failure of the Federal Information Locator System and the need for a redesigned system to replace it. The bill under consideration by the 101st Congress, the Federal Information Resources Management Act (S. 1742), mandated a

new kind of information inventory, one designed for the public to use to locate government information resources.

The evaluation of McClure, et al. (1990) marked[15] a shift in emphasis for an information locator from paperwork reduction and control (early 1980s) to dissemination (early 1990s) (p. 4). They concluded that "Although FILS is a Congressionally-mandated system, it has limited effectiveness and has a very limited audience. The Congressional mandate for the creation of FILS, while well-intended, was inadequately conceived and its implementation poorly designed. Yet, such a system must be operated by OMB-OIRA to satisfy existing statutory requirements" (p. 9). The authors situate their understanding of a government-wide index as follows (p. 10):

> IRM and, more specifically, access to and dissemination of government information through information inventory/locator systems are important issues in Federal information policy. As the government increasingly relies on electronic means to collect and organize information, as information becomes more difficult to identify and obtain, and as Federal information systems proliferate, policymakers may wish to give greater attention to ensuring effective management and use of public information. This study offers a beginning point to discuss and debate key

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[15] It should be noted that this "marking" does not make the shift a fact; rather, it indicates a communication that carries meaning for the authors, meaning that they support by referencing various communications they understand as representing trends in government information management. These include an increased interest in inventory/locator systems, increased attention to information dissemination, ambiguity in the roles of key government agencies, increased agency-direct dissemination, the availability of electronic information resources, shifting costs for government information, a customer-service orientation, and a governmental interest in promoting a diversity of means for disseminating government information (McClure, et al., 1990, p. 24-28). Did interest in disseminating government information in fact increase at the agency level from 1980 to 1990? One could also understand that agencies–responsive to their legislated mission–used new information technology to develop different means for distributing information, and this was noticed by the library community (of which McClure and his study team were a part).

issues related to the development of a government-wide information inventory/locator system.

Part 3: The Government Information Locator Service

This dissertation turns now to an observation of the development of the Government Information Locator System. As with the earlier part of this chapter, this section begins with a chronology of events marked by the GILS Forum, by communications of Congress, and related research reports. It then explores these communications in the light of theoretical approach.

GILS Chronology

The boundary between FILS and GILS is fuzzy. The events toward the end of the FILS chronology, including the 1989 Congressional hearings and the scientific research conducted by a McClure study team, could just as well have been included here. The McClure study was initiated during the first Bush Administration (a Republican administration) under the encouragement of the director of the Office of Management and Budget, Jay Plager. Plager was the first OMB Director to undergo the process of Senate confirmation. This process gave Senators the opportunity to emphasize their priorities for the Office of Management and Budget. It also offered the nominee the opportunity to state his own priorities for the agency. Plager chose to, among other things, discuss the role of government information in relation to new technologies and the need for government to employ those technologies to manage government information resources.

Under Plager's leadership, OMB investigated strategies to implement information technology to improve these processes. It issued proposed revisions to its

government-wide information management guidance (OMB Circular No. A-130) in January of 1989. This proposal attracted considerable criticism for what the public perceived as an over-reliance on private information vendors. A revised proposal was issued in June of 1989, providing guidance that was far more agreeable to the critics of the January proposal. Plager also released in a variety of formats the FILS database for public review and solicited recommendations for its improvement (*Reauthorization of the Paperwork Reduction Act,* 1989, p. 612). In spite of these gestures, Plager was the subject of considerable criticism by Congressional oversight committees, in part because of his cooperative working with the Council on Competitiveness, chaired by Vice President Dan Quayle. This Council managed much of the regulatory review process during the Republican Bush Administration. It was the target of Democratic Congressional leaders who charged that it operated in secret without either Congressional oversight or the mechanisms that could allow for public review. It ceased operations in 1993 after President Clinton (a Democrat) was inaugurated. The chronology that follows is organized in year-by-year increments.

1990

The President signed into law a bill known as the Global Change Research Act of 1990. Its purpose was to improve the coordination of national scientific research efforts across multiple agencies and those of other nations and to build international protocols that contributed to an understanding of the earth as a global system undergoing global change. It required the development of information management systems that allowed the exchange of information which could be used to prevent, mitigate, or adapt to global

climate change (Section 104.d). The law also required the participation in the information management initiative of high level management personnel from a wide variety of Federal agencies (Section 102.b). Many of the personnel involved in this project contributed to the GILS project (Committee on Environmental and Natural Resources Research. Christian (1994) identified convergence between the two projects.

Congress continued work on the reauthorization of the Paperwork Reduction Act of 1980. The Senate considered Senate bill 1742, the Federal Information Resources Management Act and the House considered two bills, H.R. 2381 to reform information dissemination policy functions (an untitled bill, 1989) and H.R. 3695 (Paperwork Reduction and Federal Information Resources Management Act of 1990). Both of these bills failed to pass. The report accompanying S. 1742 (Senate Report 101-487, 1990), however, was adopted by the Senate in 1995 as the legislative history of the Paperwork Reduction Act of 1995. It outlined the need for the law (including the need to clarify the intent of Congress that OMB oversee third party notification rules), included criticism of how the Office of Management and Budget implemented the original Act, and described how the current bill updated the law to satisfy demands for public access to electronic government information resources.

1991

The Solomon's Island Locator Subgroup of the Interagency Working Group on Public Access met in May and November of 1991, September of 1992, and April of 1993. Of the first meeting, Phillips and Carroll (1993) wrote that ". . . EPA believed it important to convene a meeting in which agencies would share information on their information

dissemination programs, specifically, how they handle dissemination in electronic format and what issues they had faced in developing a program" (p. 461). During these meetings, agency personnel collaborated to develop a basic model for a Federal locator system (Jadlos, 1994). Those participating in these meetings were personnel from agencies which later led the development of GILS, including the U.S. Geological Survey, the Defense Technical Information Center (DTIC), and the Office of Scientific and Technical Information (OSTI). These agencies also collaborated on the Global Change Research Program begun in 1990.

Congress again attempted to reauthorize the Office of Information and Regulatory Affairs. The Senate considered two bills S. 1139, the Paperwork Reduction Act of 1991 (sponsored by Senators Nunn, Bumpers and several others), and S. 1044, Federal Information Resources Act (sponsored by Glenn). Neither bill passed, although both generated interest. Senator Glenn (a Democrat) charged the Republican Administration with operating its Council on Competitiveness in secrecy while unnamed senators placed holds on his bill, preventing the House from acting on it (*Nominations of Francis S. Hodsoll and Edward J. Mazur*, 1991).

1992

A second McClure study, jointly funded by the General Services Administration, the National Archives and Records Administration, and the Office of Management and Budget, described research on the structure of government locator systems. This study team identified existing agency systems, described their particular characteristics (characteristics of individual records and fields used, purposes for the locator, intended

audience, and so forth), identified the characteristics of successful locators, and developed a plan for a locator system that was in some ways very similar to the system described in the report written by the task force that worked on the early Department of Defense system. Both reports described a distributed system of agency-specific databases linked using software and telecommunications technology. Integral to the study team's plan was technology recently designed for library online catalog applications, the American National Standard, Z39.50, which allowed users to search one or several databases and browse the results of those searches (McClure, Ryan, and Moen, 1992).

Personnel with the Environmental Protection Agency (EPA) developed an agency-based locator system in 1992. This system provided records describing the various information resources, data files, and information of the EPA. It was distributed to agency personnel on computer diskettes and was periodically updated by new editions. It included structured records containing standardized data fields as well as the software to search and view records (Appendix D in McClure, Ryan, and Moen, 1992).

1993

Harold Shill and Peter Hernon (1993) described in general terms that agency personnel resented the legislated requirement that they publish their works through the U.S. Government Printing Office. They considered in-house publishing and direct distribution to their own already-identified public users as a far more economical strategy for disseminating government information. The National Technical Information Service (NTIS) also described its public user community as "the business community." Both kinds of government publishers ignored other audiences for government information such as

those served by the Depository Library Program (p. 44-46). Shill and Hernon considered at this time that a redesigned Federal Information Locator Service might serve a more general public and overcome the fragmentation that was developing as agencies relied more and more on their own publishing and dissemination systems (p. 46, Shill and Hernon, 1993).

The Clinton Administration declared making Federal government information available on the Internet a priority (National Telecommunications and Information Administration, 1995). The Office of Management and Budget issued a revised OMB Circular No. A-130, originally issued in 1985. The first part, published in June, 1993, instructed executive branch agencies to provide electronic information to the public, encouraged the Government Printing Office to distribute this electronic information to depository libraries, and required that agencies develop inventories of their information dissemination systems. OMB was also cooperating with the interagency working group, the Information Infrastructure Task Force (IITF), to develop a vision for a future government-wide locator system (McClure and Moen, 1994).

The IITF was established to coordinate the Administration's efforts to formulate forward-looking telecommunications and information policy (National Telecommunication and Information Administration, 1995). It met several times during the next several years to coordinate the technological development of various initiatives. One of its working groups, the Government Information Group, was dedicated to developing strategies to disseminate government information via the Internet. It was chaired by Bruce McConnell of the Information Policy Branch of the Office of Information and Regulatory Review

(Information Infrastructure Task Force, 1993; Information Infrastructure Task Force, 1993, October 27).

Throughout the 1980s congressional leaders encouraged the involvement of members of the public in the development of new information services (see for example *Electronic collection and dissemination,* 1986). In November of 1993 the Coalition for Networked Information[16] hosted a meeting for those participating in the development of GILS. The Coalition also participated in meetings of the IITF, including a frequently cited meeting with representatives of the public held in December, 1993. These representatives included librarians, representatives of the information industry, and public watchdog groups (Information Infrastructure Task Force, 1993, December).

1994

In contrast to the centralized regulatory review process employed by the Reagan Administration's Executive Order 12,291, the Clinton Administration Executive Order 12,866 required a much more decentralized review process (*OMB's Office of Information and Regulatory Affairs,* 1994, p. 28-29). The Senate considered S. 560, the Paperwork Reduction Act of 1994, and S. 681, the Paperwork Reduction Reauthorization Act of 1993. S. 560 was based on S. 1139, Paperwork Reduction Act of 1991, from the 102nd

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[16] The Coalition for Networked Information was formed in 1990 by the Association of Research Libraries, Educom, and CAUSE. It's mission emphasizes the need to encourage the use of networked information and applications in ways that are useful for educational and research activities. As a consequence of this mission objective, the Coalition attempts to influence government policies, the standards-development process, and the practices of various organizations, all of which influence how international computer networks operate (CNI, http://www.cni.org/program/. Accessed February 5, 2002).

Congress; S. 681 was based on S. 1044, the Federal Information Resources Management Act, from the 102nd Congress, which was itself based on S. 1742, Federal Information Resources Management Act, from the 101st Congress. These bills included an increased emphasis on requiring the dissemination of government information to the public: "The legislation's mandate is clear: OMB has an obligation to promote public access to government information through the development and oversight of government-wide information dissemination policies. Likewise, agencies have an obligation to conduct their dissemination activities to ensure that the public has timely and equitable access to public information" (Committee on Government Affairs, 1994, p. 40). S. 560 and S. 681 were combined and passed by the Senate. They were referred to the House but did not pass before the 103rd Congress adjourned.

The initial vision document for GILS, "The Government Information Locator Service (GILS)" was released by the Information Infrastructure Task Force May 2, 1994 (Christian, 1994). The GILS Application Profile was released in 1994 in three nearly identical forms. On May 7, 1994, McClure and Moen released the GILS Application Profile as part of their third study, *The Government Information Locator Service (GILS): Expanding research and development on the ANSI/NISO Z3950 Information Retrieval Standard* which was published in September 1994; on December 7 the National Institute of Standards and Technology (NIST) released Federal Information Processing Standard on GILS, FIPS 192; and also in December, the Open Systems Environment Working Group–Library Applications Special Interest Group approved and released "Part 31: Application Profile for the Government Information Locator Services (GILS)." The

McClure and Moen profile was available to the Government Information Group of the IITF in early versions. IITF meeting minutes trace work done on the profile, including its review by the National Information Infrastructure Advisory Council (Information Infrastructure Task Force, 1994).

National Institute of Standards and Technology (NIST) published the draft of FIPS 192 for GILS in the *Federal Register* in July, requesting that comments be returned to NIST in October. They also solicited comments directly from those who had participated in the December, 1993, meeting about GILS hosted by the IITF (McConnell, 1994). In July the IITF reviewed the bulletin under development by the Office of Management and Budget describing the implementation for GILS. This bulletin provided agency personnel deadlines for its implementation. It defined the purpose of GILS as described in *The National Information Infrastructure: Agenda for Action*, published September 15, 1993, and identified its authority as that found in OMB Circular No. A-130. The second part of the circular, issued in July 1994, provided agencies with guidance for managing information technology and information systems.

In July of 1994 William Moen announced the establishment of the GILS Forum on a variety of discussion lists. This forum was an electronic mail list dedicated to the further development and implementation of GILS (see, for example, GOVDOC-L (1994, July 7). Subject: The GILS Forum: An Electronic Discussion Group). Its membership was open to anyone interested in the development of GILS and included vendors, policy analysts, librarians, and agency personnel. It was not limited to the Federal government project or

constrained by the political boundaries of the United States. It was hosted by the Coalition for Networked Information.

Ameritech Library Services, a major vendor of online library catalogs, was conducting tests of its Z39.50 client for interoperability (Graubart-Cervone, J. (October 29, 1994) Subject: Seeking GILS Z39.50 Servers). In October, members of the GILS Forum communicated technical problems associated with using WAIS to support GILS (for example, Fisher, A.R. (October 13, 1994) Subject: Re: GILS Software Pointers).

By this time Mosaic, developed at the University of Illinois' National Center for Supercomputing Applications, was the software of choice for Internet users (Andreeson, M. quoted in Nebert, D. (October 13, 1995). Subject: Seeking GILS Z39.50 Servers). Forum members began to debate the potential viability of presenting government information by means of HTTP and HTML. This technology, however, did not yet support searching as was possible with WAIS (Goldman, J. (October 13, 1994). Subject: GILS Software Pointers). A member of the Forum noted that there was no such thing as a Z39.50 URL, nor would Mosaic have known what to do with one (LeVan, R. (November 3, 1994). Subject: Re: Demo GILS client and servers). Another member explained the identifier portion of URLs that have been developed by the Internet Engineering Task Force (http://, gopher://, ftp://) and that technically they could develop identifiers for both Z39.50 and Telnet (Summerhill, C. (November 4, 1994). Subject: Re: Demo GILS client and servers).

Forum members also explored ways of creating and managing the actual GILS records, discussing such issues as what format the original record should be in, where it

should be saved, where the collection of records should be stored, who should do the actual creating of records, how they should be created, and whether they should be in an original format that is easily translated into other formats. The authoritative guidance in answering these questions was the GILS Application Profile, yet the Profile did not provide specific instructions that determined the selection of software or uniform procedures. It provided a description of the ultimate product: a record describing a government information product or service.

On December 7, of that year OMB issued its final version of its bulletin setting forth the applicable definitions, specifications, implementation schedule, agency responsibilities, and information contacts for GILS (OMB Bulletin 95-01). NIST also released FIPS 192, setting forth the technical framework for GILS (1994, December 7). By the 21st of December, list members were discussing shortcomings of the Profile and the need to revise it because of other related developments (Hastings, J. (December 21, 1994). Subject: Draft GILS guidance).

1995

As of January 1995, the Information Infrastructure Task Force had turned its attention from the development of GILS to other issues. It announced the GILS Forum and did not, according to meeting minutes, concern itself further with the development of GILS (1994-1995).

The new 104th Congress convened in January of 1995 and immediately reintroduced the Paperwork Reduction Act which had stalled in committee during the 103rd Congress. These bills were to amend the original Paperwork Reduction Act of 1980,

to reauthorize the Office of Information and Regulatory Affairs, and to provide a legal mandate for GILS. The Senate began consideration of S. 244, the Paperwork Reduction Act of 1995, and the House considered its companion bill, H.R. 830 (known by the same name). S. 244 was considered by both chambers and passed in slightly different forms. Both chambers agreed to the conference committee report in April. This act was passed after more than five years of congressional debate. It covered by statutory law the requirements already expressed in OMB Circular No. A-130 that executive branch agencies disseminate government information in electronic formats and required the implementation of GILS (Section 3511). It also "preserved" the legislative history of the Paperwork Reduction Act of 1980. That is, it claimed the same relation to other laws and practices that the Paperwork Reduction Act of 1980 had claimed (S. Rept. 104-8, p. 28; 141 Cong. Rec. S3505-3505, Statement of Senator Roth). President Clinton signed it into law on May 22, 1995 (Pub. L. 104-13, 109 Stat. 163).

In 1995 GILS Forum members discussed continuing the standards-development process by writing a Request for Comment (RFC) to cover GILS. This document would have been a more general or international description of the GILS profile than the Federal government version contained in the FIPS 192. A draft was offered on the Forum but after discussion of the purposes for Internet RFCs, it was never finished (Christian, E. (February 14, 1995). Subject: Re. : RFC for GILS; Christian, E. (February 16, 1995). Subject: Draft RFC for GILS). Related to this work was the formation of the GILS Subgroup of the Open Systems Environment Implementors' Workshop, Library Applications Special Interest Group (OIW/SIG-LA). This standards organization served

as the venue for the development of GILS as an international voluntary standard. The GILS Subgroup hosted monthly meetings (at various Federal agencies in the Washington, D.C., area) for GILS developers and served as the organization governing GILS as an international standard. Its membership included vendors (both service and software providers), implementors, and other interested parties and was not limited to citizens and corporate representatives from the United States. Their first meeting was in March, 1995, in Washington, D.C. Minutes of each meeting were routinely posted to the GILS Forum. Meeting announcements routinely included the statement that decisions were made by the Forum membership rather than the subset who were able to attend the face-to-face meetings.

During March, the National Archives and Records Administration made available its guidance for the U.S. Federal GILS project. This guidance was based on the GILS Application Profile (McClure and Moen, 1994) and conformed to the requirements of FIPS 192 (National Institute of Standards and Technology, 1994).[17] They also began to host periodic training sessions for Federal employees (Hirtle, P. (March 2, 1995). Subject: NARA GILS Guidance Available; Meman, K. (May 22, 1995). GILS Training Available; National Records and Archives Administration, 1994).

Early in 1995 the Canadian government began exploring its own GILS project, called the Government Information Finder Technology Project (GIFT). This project used

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[17] Note that these two documents are substantially identical. They have different purposes, however. McClure and Moen offer a scientific development for GILS. NIST provides the government requirement that executive branch agencies comply with the requirements for the structure of locator records. NARA also cited OMB Bulletin 95-01 which required that executive branch agencies construct GILS records.

Fulcrum Technologies Surfboard software (Judges, S. (May 4, 1995). Subject: Re: Canadian GILS).

Work on the implementation of Z39.50 servers continued throughout 1995. In May, Christian expressed concern that only two GILS collections were available via Z39.50- 1992 servers (Christian, E. (May 12, 1995). Subject: Re: GILS On-line). That same month, AT&T made its Z39.50 server available. Managed by a contributor to the Forum, it included a database of about 6000 Federal and State GILS records from various agencies. The server was available via the Library of Congress Internet browser-based search page (Waldstein, B. (May 16, 1995). Subject: A new test GILS database; Dixon, L.E. (May 19, 1995). Subject: Re: A new test GILS database).

ANSI/NISO Z39.50- 1995 (a minor revision of the second version published in 1992) was successfully balloted and published in May (Denenberg, R. (June 6, 1995). Subject: Z39.50- 1995). This third version of Z39.50 was compatible with the second version (Z39.50- 1992) and included object definitions needed for GILS (Denenberg, R. (October 25, 1994). Subject: Re: GILS Compliance). WAIS, Inc., the supplier of Z39.50-compliant software to GPO Access and several other agency projects, was sold to America Online (Christian, E. (May 22, 1995). Subject: WAIS acquisition by AOL).[18]

GILS Subgroup members began in June to develop a flyer to market GILS to vendors and others. The Department of Defense revealed its own promotional services, an

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[18] In May of 1996, AOL developed WAISserver 2.2 which included code to make it GILS-compliant. This software was not immediately released, but was finally distributed in 1997 by Fulcrum Technologies after their purchase of WAIS from AOL (Christian, E. (January 7, 1997). WAIS 2.2 - Platforms; Christian, E. (March 31, 1997). Fixing WAIS).

online publication, "How to Get It," describing their GILS and other services (Becks, V. (June 28, 1995). Subject GILS Flyer). The National Science Foundation, National Center for Supercomputing Applications, and the World Wide Web Federal Consortium hosted a webmaster workshop for federal employees (Christian, E. (May 15, 1995). Subject: Re: WebMaster Training at NIH 7/11-13).

The GILS Subgroup revised the GILS Application Profile to more completely align it with WAIS. This revision work continued through the next year, with periodic discussions with members of the Canadian GILS group assisting in shaping a more international, less U.S.-specific, profile.

Privacy Act Notices[19] are routinely posted in the *Federal Register*. OMB Bulletin 95-01 required that agencies also post these in their GILS databases. After concern about unnecessary duplication of efforts, inefficiency, and unfunded mandates,[20] the National Archives notified agencies that the deadline for compliance had been postponed (National Archives, 1995, August 23) and later that these records would be made available–at least temporarily–via GPO Access (Weber, L. (August 18, 1995) Subject: Privacy Act Notices and GILS).[21]

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[19] These are notices of the availability of any agency information systems containing personally identifiable information about agency staff and people who have contact with an agency.

[20] These are the same terms used during the 1980s in Congressional debates about paperwork burdens; however, then Congress was concerned about duplication of collection burdens imposed on the *public*. Here agency personnel argued for guidance that maintained the efficiency of *agency* operations.

[21] This became a more permanent solution, announced in February 1996. Agencies were required only to post a single Privacy Act GILS record to reflect the information

In September the National Archives hosted a GILS Implementors' Forum which attracted hundreds of attendees. The program included a panel discussion by a variety of GILS experts and was designed to provide answers to technical questions implementors asked (Weber, L. (August 18, 1995). Subject: GILS Implementors' Forum). That same month OMB issued Memorandum 95-22, "Implementing the Information Dissemination Provisions of the Paperwork Reduction Act of 1995." This document reviewed the goals of the Act, the value to the public associated with disseminating government information, the requirements to manage the vendors who disseminated government information, the value of agencies consulting their users concerning the management of information resources, and the value of managing government information for the maximum benefit to society.

In December, the GILS Board met. This organization, mandated by the Paperwork Reduction Act of 1995, heard from various experts on the GILS project and announced that GPO Access would build a single–although not the only–point of entry to GILS. GPO also provided some agencies a server for housing their GILS records. The support provided by this legislative branch agency to executive branch agencies was in compliance with Congressional intent expressed in Senate Report 104-8 and other places. The GILS Board ordered agencies to post the URLs for their GILS servers to the GILS Forum as a

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about their Privacy Act Systems, pointing to the GPO Access Privacy Act Notices databases, and make that record available with their other GILS records. That single record was an edited version of a model record issued by the National Archives and Records Administration, which had been developed in collaboration with members of the GILS Forum (Weber, L. (February 9, 1996). Subject: NARA memo to records officers and information resources).

way of notifying GPO of their availability (See Appendix A-5, Report of the December 6, 1995, Meeting of the Government Information Locator (GILS) Board, in McClure and Moen, 1997). Agency personnel may have needed some persuading to comply with this order, given their historic resistance to complying with requirements to publish using GPO services (see, for example, an argument posted earlier in 1995, (Christian, E. (August 1, 1995). Subject: GILS Core Entry Point; Houser, 1995; and Shill and Hernon, 1993).

December 31, 1995, was the deadline set in OMB Bulletin 95-01 for the establishment of GILS services by U.S. Federal agencies. This deadline was postponed by 30 days because of the shutdown of the federal government caused by Congress not reauthorizing continuing spending bills until appropriation bills were finally passed. This date also was described by Moen and McClure (1997) as the end of the first phase of GILS development (p. 76).

1996

In January, Canadian government personnel began to introduce to the GILS Subgroup of the Open Systems Environment Implementors Workshop (OIW) - Library Applications Working Group (by way of the GILS Forum) the way they intended to use GILS. They proposed working together with the GILS Subgroup to modify the GILS Application Profile so that it could more easily accommodate individual publications rather than collections of publications or databases (Brodie, N. (January 19, 1996). Subject: Canadian review of GILS).

Early in 1996 the GILS Forum, the potential membership of the GILS Subgroup, had 750 members. The GILS Subgroup, now a year old, began to develop a statement of

purpose in February. This statement, according to the chair of the GILS Subgroup, was intended "to describe our shared sense of purpose, and to help give us a guide and a defined scope for our activities" (Hufford, S. (1996, April 4). Subject: revised draft statement of purpose for the GILS Subgroup). The early drafts of the statement of purpose revealed that the members themselves did not have a clear understanding of the Subgroup as a voluntary international standards development organization. Their first draft described the group in terms of a U.S. Federal government interagency working group (Moen forwarded to the GILS Forum Hufford's message (February 8, 1996). Subject: Summary of 1/23/96 Meeting of OIW/SIG-LA GILS Subgroup; Hufford, S. (May 8, 1996). Subject: Summary of 4/23/96 meeting of OIW/SIG-LA GILS Subgroup; see also several messages between).[22] That draft generated several messages calling for a more general description of the international group. Eventually, they developed a statement that was acceptable to the membership of the GILS Forum.

February 22, 1996, David Barrum, chair of the GILS Board, distributed a press release announcing GILS, describing it as "a new electronic directory of public information available within the federal government [which] can now be easily accessed by the public" (Weiss, P. (February 22, 1996). Subject: Notice of GILS Availability). Also in February, OMB issued a revision to Circular No. A-130 (61 *F.R.* 34, p. 6428-6453),

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[22] See, for example, Steve Hufford's revision of the statement of purpose, March 6, 1996. He offered an apology and an explanation: "please note that the proposed statement was not meant as a slight to international or other non-U.S. Federal GILS. One of our original goals in developing the draft statement of purpose was actually to clarify the Subgroup's role with respect to the U.S. Federal GILS. In attempting this, we inadvertently overemphasized that role" (Hufford, S. (March 5, 1996). Subject: revised draft statement of purpose for OIW/SIG-LA GILS Subgroup).

incorporating into this policy document guidance on establishing security measures to protect government information resources that are connected to the Internet. This revision brought A-130 more in line with the Computer Security Act of 1987 (15 U.S.C. § 5524 and elsewhere) and the Paperwork Reduction Act of 1995 (Office of Management and Budget, 1996).

Users in March reported problems with using the GILS databases. Two well-informed list members could not get their Z39.50 servers to complete transactions with other servers (Levan, R. (March 5, 1996). Subject: Re: Re[2]: Availability of USNRC GILS; Dixson, L. (March 6, 1996). Subject: Re: Availability of USNRC GILS). A member of the Canadian group reported that she demonstrated several GILS sites successfully, but that her audience complained of the many varied designs of the interfaces to these sites (Turner, F. (March 11, 1996). Subject: Z39.50/GILS). This month also saw some public criticism of the GILS project. Steve Hufford, Environmental Protection Agency and a leading advocate for GILS, responded to a critical editorial in *Government Computer News* with a letter to the editor. His description of GILS referenced its historical context: "GILS is beginning to realize the promise of the old Federal Information Locator System (FILS) concept and is already improving public access to government information." (Hufford, S. (1996, March 12). Subject: Re: Food for Thought (and publication))

During this month the Open Systems Implementors' Workshop/Library Applications Special Interest Group met in Brussels and accepted GILS Profile, version 2; however, the profile continued to be updated after this decision (Guenther, R. (October

11, 1996) Subject: Re: GILS to USMARC Mapping; Christian, E. (October 29, 1996) Subject: Profile v2 changes in USMARC Mapping). The Library Applications Special Interest Group also turned over further development of the Profile to a newly-formed GILS Special Interest Group (Christian, E. (October 10, 1996). Subject: GILS Profile version 2 approved).

In November, the Canadian GILS pilot project was launched. The U.S. Federal GILS was named a finalist in the NII Awards Program (Christian, E. (November 13, 1996) Subject: GILS is finalist for NII Award), GPO Access's GILS site was voted favorite web site in the Week's Accounting Top Five Web sites, sponsored by Harcourt Brace Professional Publishing (Ries, V. (November 19, 1996). Subject: GPO GILS site wins award), and a second GILS Conference was held. This conference drew an audience of implementors and users of GILS, including librarians, public advocates, vendors, and experts (Hufford, S. (August 9, 1996) Subject: Announcing the 1996 GILS Conference).

In December, a list member voiced concern that several commercial Z39.50 software packages were still not GILS-compliant. He reported that several freeware products, including CNIDR's Isite and IndexData's YAZ and Zebra products were compliant (Christian, E. (December 16, 1996). Subject: RE: GILS Complaint replacement for WAIS?). December 31 was also the deadline for requesting from the National Archives and Records Administration disposition authority for unscheduled records described in GILS.

1997

Some time during 1997, the National Center for Supercomputing Applications ceased development of its Internet browser, Mosaic (National Center for Supercomputing Applications, 1997). Fulcrum Technologies, Blue Angel Technologies, and other vendors collaborated to provide a variety of turnkey applications for creating and managing GILS-compliant systems.[23] Seachange Corporation released its "Bookwhere?" software, a Z39.50 client for Windows 95 and Windows NT, reporting that it was fully GILS-compliant (Christian, E. (March 31, 1997). Subject: Fixing WAIS).

The GILS Profile had always contained a crosswalk or mapping of GILS elements to USMARC fields. Implementors of computer systems for managing GILS records and USMARC records used this mapping to transform these records from one format to the other. This project, managed by the Library of Congress, had undergone several revisions as GILS was refined, in particular as the Canadian GILS project refined GILS to more readily accommodate individual publications. In April, the Library of Congress posted crosswalks that included GILS, Dublin Core,[24] and MARC (Guenther, R. (April 3, 1997).

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[23] See Hill, L. L. (May 9, 1996). Subject: Re: Profile: Place data element; Restivo, J. (February 27, 1997). Subject: Blue Angel Technologies, Inc. Announces New GILS Service Targeted at Smaller Government Agencies; Christian, E. (March 31, 1997). Subject: Fixing WAIS; Riewe, J.S. (May 21, 1997). Subject: Fulcrum and Blue Angel Press Release; Murphy, L. (July 14, 1997). Subject: AltaVista/BlueAngel Technology Z39.50 Server Available; Riewe, J.S. (August 19, 1997). Subject: Information Server Announced; Riewe, J.S. (September 2, 1997). Subject: Blue Angel Technologies/Sovereign Hill Announcement.

[24] Dublin Core, another metadata profile, had been under development for some time by the museum and archives community. It contained fewer elements than GILS and was designed to describe nearly anything that might be part of a museum collection or service. MARC was a metadata format was designed in the 1960s to describe publications. It

Subject: GILS/MARC mapping; Guenther, R. (April 7, 1997). Subject: Dublin Core to MARC and GILS mapping).

In April, GPO Access announced an expanded GILS-related service: users could search the WAIS-based GILS records *not* hosted by GPO Access (Ries, V. (April 10, 1997). Subject: NEW GILS feature on GPO Access). GPO hosted more than two dozen agency GILS collections and maintained links to many more agency collections, serving to some extent as a single entry point for the U.S. Federal GILS project. In November, they announced a further refinement to the project, the ability to browse an individual agency's GILS records (Amey, V. (November 19, 1997) Subject: Browse GILS on GPO Access).

Messages posted to the GILS Forum this year included extended debates about new ways to manage GILS records using SGML, XML, and META tags embedded in HTML pages linked to a Subject Tree (as used by the Washington State project, Stucki, C., posted for Phil Coombs (May 1, 1997). Subject: GILS META tags in HTML). The Washington State description generated several responses from implementors in other countries, including Sweden, Australia, and Germany, of similar projects.

In May, McClure and Moen released the results of their evaluation, *An Evaluation of the Federal Government's Implementation of the Government Information Locator Service (GILS): Final Report. June 30, 1997.* (1997). They offered criticism and praise for the project. Working from a model of information search and retrieval common to libraries, these researchers concluded that GILS fell short of its objectives because its

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allows users to use cataloging records in many different automated library cataloging systems and to send those records electronically across computer networks (Furrie, 2000).

implementors lacked an understanding of and appreciation for the principles for identifying and describing other writings (they cited Patrick Wilson's *Two Kinds of Power: An Essay in Bibliographic Control*). They praised GILS implementors as early adopters of networked information discovery and retrieval technology (p. 6).

In August, NIST released FIPS 192-1, the revised version of the federal information processing standard governing the implementation of GILS. It was based on the second version of the GILS application profile developed by the GILS Subgroup of the Open Systems Environment, Library Applications Special Interest Group. This announcement of the Federal Standard was not posted to the Forum. Some members became aware of it only after it was referenced by an OMB bulletin in February, 1998.

In November, the GILS Subgroup lost its leader, Steve Hufford, who was assigned to a special project in the Environmental Protection Agency (November 17, 1997, Subject: next meeting of GILS subgroup). Another member argued for a more international focus for the GILS Forum (Christian, E. (November 20, 1997). Subject: NOT "by its nature this is an American list"). A Danish member admitted that the forum was watched carefully by a steadily growing number of people as an excellent source for ideas about technology to manage information search and retrieval (Hammer, S. (1997, November 21). Subject: Re: NOT "by its nature this is an American list"). A Canadian member reported that she cited GILS as a model for developing an international standard (Brodie, N. (November 23, 1997). Subject: Re: NOT "by its nature this is an American list").

OMB issued Bulletin 98-03 on November 25. Appendix C referenced the requirements of Circular No. A-130 and asked agencies to submit information on their

information dissemination management systems including their GILS implementations to the Office of Management and Budget (Weiss, P. (November 25, 1997). Subject: OMB Bulletin asks for agency GILS implementation information). The next month, OMB Bulletin 95-01 expired.

1998

In February the public advocacy organization, OMB Watch, hosted a meeting of the Public Access Working Group. This group, composed of representatives from such organizations as Public Citizen, the Information Trust, Unison Institute, and OMB Watch, met with representatives from the Office of Management and Budget (OMB) to discuss the need to reissue OMB Bulletin 95-01. Peter Weiss of OMB expressed no need to reissue that bulletin because the legislation that originally prompted it was still in force; consequently, the compliance requirements were still in force. Members of the Working Group expressed concern that without a renewed bulletin, agency personnel would not be able to retain funding for the maintenance of GILS (McDermott, P. (February 9, 1998). Subject: Report on meeting with S. Katzen re: GILS, etc). Two days after this meeting, OMB issued Memorandum 98-05, reminding agency personnel that the responsibility for maintaining GILS and providing public access to agency information services remained. This memorandum instructed agency chief information officers to continue to develop GILS toward the goal of one-stop access across multiple agency services (Weiss, P. (February 11, 1998). Subject: OMB Guidance on the Government Information Locator Service). The next month Christian quelled rumors that GILS and FIPS 192-1 were no longer in force.

In March, Eliot Christian was awarded the American Library Association James Madison Award in Washington, DC. The Association commended him for his personal vision for GILS, his commitment to providing public access to government information, and for the resulting international influence of a democratic model for public access to government information (Brodie, N. (March 5, 1998). Subject: Madison Awards Press Release (fwd)).

The GILS Special Interest Group met for the last time (as reported on the GILS Forum) in April of this year (Amey, V. (April 30, 1998). Subject: meeting summary 4/28/98). Meetings had been sporadic since Steve Hufford resigned as facilitator of the group. In spite of calls to host meetings beyond the Washington beltway, no further meetings have been reported on the GILS Forum.

After several months of attempting to fold GILS Use Attributes into the Bib-1 Attribute Set, the proposal was approved in June by the Z39.50 Implementors Group. In July the Z39.50 Maintenance Agency at the Library of Congress modified the Bib-1 Attributes to include the GILS Attributes (Christian, E. (July 21, 1998). Subject: GILS Use Attributes merged into BIB-1).

In August various forum members argued about making agency information resources available on the web. Some favored posting the information whether it had been cataloged or not. A member employed by the Department of Justice argued that the cataloging record model inherent in GILS had been a failure because it did not contribute to the agency mission and cost more than it was worth. He argued for some other strategy

to search across multiple agencies and retrieve relevant information arranged in relevancy order (Schneider, D. (August 11, 1998). Subject: Re: The Policy of GILS).

The Ohio Supercomputer Center, ECLIPS Program released a report on interoperability and government information resources, "Eliminating Legal and Policy Barriers to Interoperable Government Systems" (Landesbergen and Wolken, 1998). This report used GILS as a case study from which to develop recommendations for improvement. Its authors praised GILS and recommended the creation of metadata and aligning information collection and information management standards.

1999 to Present

During 1999 the list carried several debates about metadata for online information resources. It carried several announcements by vendors of new software packages to manage GILS metadata. Significant to many of these efforts was the use of XML-tagged metadata.

In December, GPO installed a new GILS-compliant version of commercial WAIS software. This message included a list of Z39.50 URLs to be used to provide direct search access to the GPO Access databases (Christian, E. (December 22, 1999). Subject: GILS Interface to GPO WAIS databases). In October of 2000, one list member questioned whether this upgrade of the Z39.50 software was completely successful (Christian, E. (October 18, 2000). Subject: Re: Updating of Web pages at www.gils.net).

By April of this year, different agencies were providing access to GILS records by means of a variety of commercial software packages. The Defense Technical Information Center was using Blue Angel Technologies software to provide a gateway to its GILS

information resources (Molholm, K. (April 26, 2000). Re: Building portal. . . advice/info needed). It had initially used a WAIS server (Becks, V. (September 29, 1995). Subject: GILS Complaint Directory). The Washington State GILS project used Netscape Compass Server with the GrapeVine application to generate WAGILS metadata (Palmer, G. (April 26, 2000). Subject: Re: Building portal. . . advice/info needed), and the United States Geological Survey used an Ultraseek server along with a suite of other software packages to serve its data (Christian, E. (April 26, 2000). Subject: Re: Building portal. . . advice/info needed).

In May of 2001, Christian announced a new discussion list created for those interested in a revision of the GILS profile (Christian, E. (April 25, 2001). Subject GILS Evolution). This list has not been productive.[25] Later that year Bill Moen published a summary of the development of GILS from his own perspective (Moen, 2001). In January 2002, the government invited vendors to bid on providing FirstGov services.[26] The bid documents included an "Additional Questions and Clarifications" statement that required that the system must comply with FIPS 192-1, *Application Profile for the Government Information Locator Service (GILS)*. This requirement was not in the original bid

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[25] A few of its members introduced themselves to the list as their initial message, but the list has generated neither discussions nor decisions.

[26] FirstGov is an Internet portal that allows users to search web sites across the Internet. It's URL is http://firstgov.gov/. In 2002, it indexes approximately 50 million web pages and allows users to search those indexes using keywords. It provides a results list in relevancy rank order. Each entry includes the URL and keyword in context (KWIC) information.

document, nor was it included in the evaluation matrix (see http://www.eps.gov/EPSData/GSA/Synopses/128/GSA00A02PDR0002).

Developers from the Ohio-based library information service company, OCLC, have been involved in the development of the Z39.50 standard and of the GILS service for several years. OCLC recently announced plans for future enhanced capabilities for their WorldCat database. This database provides access to the cataloging records created by libraries from around the world. The enhanced services they described included providing access to government information locator records (Chang, 2001).

The GILS Forum from its beginning has collected nearly 1600 messages. The nature of the list has changed over the years. During the first few years, most messages concerned coming to agreement on the elements of the GILS records; technical and software issues; organizing, managing, and reporting on meetings; the process details for establishing GILS records; and the requirements for GILS services. Many messages contributed to reaching agreement on the GILS Profile and its revision. Agency personnel discussed ways of creating their GILS records using available office productivity software (word processing, spreadsheet, and database software).

As newer technologies became available, list members communicated about the relation of those technologies to GILS, their advantages and disadvantages, and how to make use of them. For example, when harvesting software became available, list members argued to do away with the burden of creating GILS records and simply provide keyword searching of harvested indexes built from agency web sites. U.S. Federal agencies were constrained, however, by the requirements of law, National Archives and Records

Administration guidance, OMB guidance, and a federal information processing standard (FIPS 192 and later 192-1). Many agencies eventually provided users with both strategies for finding information, and FirstGov provided search services government-wide, including state and local government sites in 2000.

After the second revision of the GILS Profile in 1997, communications concerned building strategies for automating the GILS record creation process. Several list members worked with SGML, XML, and other ways of formatting GILS records to facilitate managing them. During 1997 and 1998, the Forum carried several announcements from vendors about new software packages for managing GILS. The Forum also received many messages announcing technology conferences and workshops, new Internet services, publishing opportunities, and other Internet-based projects. The list has since grown quiet with only a couple dozen messages in 2001.

Some communications governed the development of GILS in obvious ways. The vision document of Christian (1994) was frequently referenced as determining the nature of the service. The GILS Application Profile developed by McClure, et al., (1994) was restated in the NIST FIPS PUB 192, and reinforced by the guidance provided to executive branch agencies in OMB Bulletin 95-01. The Profile constrained the guidance provided by the National Archives and Records Administration on the structure and content of record elements. If a new list member asked what GILS records needed to contain or offered suggestions for new kinds of records, that list member was referred to those guiding documents.

Theoretical Reflections on GILS

This section of chapter 5 includes reflections on concepts related to the development of GILS, then turns to observations of the political system. The concepts discussed here include complexity, simplicity, and exploration of the standards-development process.

These concepts were chosen from among many concepts GILS Forum members referenced throughout the development of GILS. They are representative in that they surfaced again and again across time in the messages sent to the GILS Forum. They need not be taken as central or typical themes for GILS, but only as three concepts among many that were expressed in relation to GILS. They were chosen from among the possible concepts associated with GILS because of my own interest in them.

A concept that surfaced frequently during the development of GILS was the perceived complexity or simplicity associated with the standard or its use with government information. According to Luhmann, complexity refers to the requirements that a system make selections among several possibilities (Luhmann, 1995, p. 23-29). The system experiences more than a one-to-one relation among its elements which motivates a need to make decisions, to make selections from several possibilities. Immediately, risk emerges along with the possibility that the system makes "the wrong decision."

Christian, who is credited with coining the name of GILS (Moen, 2001), declared simplicity of finding government information as a central goal of GILS, suggesting the possibility that one could expect to conduct simple, precise searches and retrieve exactly the information one needs (Christian, E. (December 1, 1995). Subject: GILS Overview

(long message)). This was one of the design principles McClure, et al., reported in their 1990 study. Sprehe, offering agency personnel guidance for implementing GILS, recommended keeping the project as simple as possible. The strategy he recommended involved describing the requirements for the GILS project in terms of information management work already being done by agency personnel (Sprehe, 1995).

When the Profile was undergoing revisions, several participants attempted to keep the changes as simple as possible even as they were contributing additional complexity.[27] One participant suggested a simple "GILS-lite" version, a profile that specified only four elements (that suggestion was not pursued by list members given the requirements of Christian, 1994, and other structural documents) (Javanpour, O. (August 14, 1996). Subject: Re: Sharon Jeffrey's input to GILS DTD).

These efforts reflect the programmer's ideal of a kind of elegance of design, accomplishing objectives with simple yet powerful code (Anthes, 1998; Gelernter, 1998). In a complex environment, according to Luhmann, a system makes selections from multiple possibilities in the environment of a system. Even though designers seek elegance of design, their work relates to a Luhmannian concept of complexity. Many strategies for accomplishing an objective exist. The designers communicated various possibilities and

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[27] (Donelon, S. (November 11, 1994). Subject Re: Re[2]: re. USMARC, MARC, and Z39.2; Denenberg, R. (June 13, 1995). Subject: re. Minutes of June 9 GILS meeting at USGS; Turner, F. (April 22, 1996). Subject: Re: SERIES Element in GILS Profile; Waldstein, B. (August 16, 1996). Subject: Re: Sharon Jeffrey's input to GILS DTD; Turner, F. (September 12, 1996). Subject: Re: Time Period Elements in GILS Profile; Christian, E. (July 29, 1997). Subject: Relationship of GILS to BIB-1 Attribute Set; Christian, E. (August 12, 1998). Subject: Z39.50 Attribute Architecture Review Extended).

from their debates, conducted in relation to previous structurally constraining communications, emerged decisions about a particular selection.

An example is Attachment N of Moen and McClure's 1994 final report on the GILS project. Moen, responding to stakeholders' questions and concerns, offered a compiled response from two project participants who outline several possible technological solutions to the problem of making information available. Their list included gopher, WAIS, HTTP, SFQL (a protocol related to SQL), and Z39.50. They argued that, given the constraints associated with the GILS project (available implementations, deadlines, the preference for an open-systems standards-based solution, the demand for keyword query capabilities, access via the Internet, and so on), the Z39.50 standard was the preferred solution. They described here the general "goodness" of the standard, the characteristics that made it the preferred solution. It handled both search and retrieval processes; it returned information in a variety of formats, including a format selected by the user; it carried URLs; it was already implemented in numerous projects–it had an expert user community; it could be upgraded later as expertise developed; and although a complex standard, the GILS profile provided the required elements specified in the original GILS document (Christian, 1994).

Rejected in this document were the following arguments: developing from scratch an entirely new strategy to present information; specifying a strategy that does not allow searching (gopher or HTTP); selecting a technology with only limited instances where it had been successfully implemented (WAIS 1988); or selecting a strategy that required highly specific rules for searching (SFQL). The solution chosen promised powerful

keyword and field-specific searching, user-friendly display capabilities, the expertise of the implementor community, and the potential for improvement. Moen and McClure argued that these considerations represented the various user (implementors and end users) perspectives that drove the standards development process. It was elegant in that it was powerful as well as simple (or at the least, simpler than other possible solutions).

Forum members debated the benefits of presenting government information using HTML and relying on Internet search engines to search the full text of entire collections (these debates were especially intense in August 1995, March 1996, June 1997, and August 1998). The advantages and disadvantages of each strategy changed over time. HTTP supported far more complex search capabilities by 1998 than it had in 1995. In general, agency attention to GILS fell off after its initial implementation in 1995, producing an increasingly out-of-date collection of records. Consequently, the early strengths of the Z39.50 solution for GILS were partly eroded as technology changed and records aged. Those advantages and disadvantages are summarized in Table 5.1.

The development of GILS has been described as a model for the standards development process (Brodie, N. (November 23, 1997). Subject: Re: NOT "by its nature this is an American list"). The work of reaching agreement on the GILS profile, especially the second version of the profile occurred in large part on the GILS Forum and is, therefore, observable. According to Martin Weiss, the standards-making process is essentially a political process motivated by economic interests involving strategic negotiating among interested parties. Many of these interested parties were software developers interested in preserving the economic advantages of their own company while

participating in a process of negotiating toward consensus. He cites the folk wisdom that consensus is achieved "when everybody is equally unhappy" and that the standards development process follows "the Principle of Equal Pain;" that is, the technical attributes embedded in the standard cause "everybody to suffer approximately equally in terms of departure from their preferred outcomes" (Weiss, 1993).

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Table 2

Advantages and Disadvantages Associated with GILS and HTTP

	Z39.50	HTTP/HTML
Advantages	• Presents information in a variety of ways • Allows searching of multiple databases using one search • Allows both providers and end users a great deal of freedom in the management of information • Allows both powerful fielded searching (non-trivial searching) and free text (keyword) searching based on structured metadata • Allows implementors of end-user services to design a common interface for searching multiple databases • Can operate independent of the World Wide Web • Takes advantage of semantic consistency of profile-specified fielded data–profile-specified data provides consistency across multiple records and shares with searchers the semantic meaning of those fields	• Widely accepted and supported on the World Wide Web • Well integrated with other network services • Allows linking resources to each other • Does not require special client software • Highly flexible
Disadvantages	• Frustrates automatic extraction of data • Invisible to HTTP-driven search tools • Used by a limited community • Requires specialized software • Generates complex URLs • From a cost-benefit analysis perspective GILS is not perceived by many agencies as generating a positive return on investment	• Provides no standard vocabulary • Provides only limited options for searching (trivial search capabilities) • Requires that provider determine end-user interface • Does not allow limiting search to certain kinds of resources • Does not search the contents of many databases • Does not very well describe the results of searches

GILS, having been developed for use with Z39.50, was related to the Open Systems Interconnection Protocol (OSI). Z39.50 was originally developed for use with this network protocol. Lynch modified and tested Z39.50 for use on a simpler network protocol, TCP/IP (Lynch, 1994; Preston and Lynch, 1994; see also Moen, 1998, for an extensive discussion of the development of Z39.50). Yet the OSI model cast a shadow of perceived complexity over the GILS project because of its relation to another government standards-driven project, GOSIP (Government Open System Interconnection Profile).

Aden and Harris (1993) describe the standards development process, referencing the GOSIP as its model. This standard specified a profile of communication protocols based on the OSI model which allowed dissimilar computers to communicate across a network with each other. The OSI model was developed according to the formal voluntary international standards process and, thus, was a *de jure* standard. It specified a complex 7-layer model for network communications. It was issued in 1988 after nearly 10 years of careful development in collaboration with software and computer vendors; it involved more than 20 Federal agencies, the Federal Networking Council, the Internet Activities Board (IAB), the Internet Engineering Task Force (IETF), and the Open Systems Interconnection Working Group all working in concert with the National Institute of Standards and Technology (NIST) (Ebel & Mills, 1990; Cerf & Mills, 1990; Mills, 1990). About 80 percent of the first GOSIP standard overlapped other manufacturing, technical, and corporation system specifications and complied with all of them.

The objective of the government was to provide a quality standard that was open to all vendors (not vendor- or product-specific) and to persuade vendors that government

was a commercially profitable market to target (Mills, 1990). "The motivation behind the creation of the U.S. GOSIP document is to achieve, in the long term, a common, vendor neutral, interoperable computer communication capability throughout the U.S. Government" (Cerf and Mills, 1990).

It should have worked (according to the best expectations of those participating in this work and even the predictions of those conducting scientific research). GOSIP, however, was in direct competition with TCP/IP, a *de facto* standard–it had the advantage of wide acceptance but lacked the background of the formal, international consensus process. TCP/IP was developed by the Internet Engineering Task Force using a process of "rough consensus and running code," a process that resulted in experimentation, multiple implementations, and fast product development (Wood, 1994).

GOSIP presented economic risks to vendors. In theoretical terms, economic communications involve buying and selling. Economic decisions are made in relation to profits and losses. From a vendor's perspective GOSIP, based on the OSI protocol, was not fully developed. It presented economic risks to a company because of high levels of uncertainty. How could a company meet customer expectations when those expectations were changing rapidly? From the time the equipment was specified and ordered until the time it was received by the customer, the specification may have changed and certainly the expectations of what could be accomplished using the machine had changed. GOSIP was a constantly moving target. It was judged as very complex and difficult to implement, requiring the vendor to provide time-consuming and expensive after-the-sale support and training. It was difficult to implement, unnecessarily expensive, time-consuming, and

complicated (characteristics which excluded small businesses from the government market because of its inherent risks). It required expensive conformance testing and a great deal of customer training and support (Aden and Mills, 1993, Johnson, et al., 1993). GOSIP was a failure. Yet Federal government agencies were required by FIPS 146 (a Federal Information Processing Standard) to specify GOSIP for major computer purchases. These descriptions developed in relation to another network protocol which was described as less expensive, less complicated, and more dependable, TCP/IP.

TCP/IP was used widely by universities; it was widely subsidized by government grants, free to commercial suppliers in the U.S. and ready to implement (giving U.S. manufacturers a competitive edge over international vendors, thus limiting the competition, reducing the number of potential vendors), familiar to technical staff employed by government agencies, and widely available in computer equipment available for purchase; it was the "*lingua franca* of the Internet" (Mills, 1992). By 1994, NIST recommended that the government recognize *de facto* Internet Engineering Task Force standards (like TCP/IP) as equal to international *de jure* standards (like GOSIP), that the judgment be on the products standards produced rather than the characteristics of the standards themselves (Federal Internetworking Requirements Panel, 1994; Wood, 1994) and by 1995, the government formally reversed its decision to require GOSIP compliance in computer procurement processes (National Institution of Standards and Technology, 1995).

The GOSIP development process was related to that of GILS (see, for example, comments by Houser, 1997). Both resulted in Federal Information Processing Standards,

both followed a process of formal *de jure* voluntary international standards development, and both avoided vendor-specific preferences. Both were criticized for unnecessary complexity, and both were overwhelmed by more widely-deployed technologies. In the case of GOSIP, TCP/IP dominated the market. In the case of GILS, agencies developed web sites with collections of HTML-coded documents they made available through harvest software. That software indexed those collections and provided users with keyword search capabilities without the laborious processes of manually cataloging documents using the guidelines of the National Archives, of implementing Z39.50 server software, or requiring that customers use Z39.50 client software. A readily available Internet browser was all customers needed to access particular agency information products.

Errors were also a topic of discussion on the Forum. Early in 1995, messages mentioned problems with browsers or Internet connections. Those messages constructed meaning about the difficulty of the GILS project. The uncertainties associated with testing access and interoperability involved more than the compatibility of client and server software or different Z39.50 implementations. It involved early in the history of the list the reliability of the network and the technologies operating between the client and server software (for example, (McCulloch, T. M. (1994, October 4). Subject: re: GILS Demo for White House Server) (Hirtle, P. (1995, February 14). Subject: GILS Information). Questions of responsibility for errors in URLs contained in the database records also surfaced early. Was the error the responsibility of the database author (or in this case the various authors of a collection of GILS records), or was it the responsibility of the

database provider (Waldstein, B. (1995, May 26). Subject: Re: A new test GILS database)?

From time to time questions arose about claims of "GILS-compliance." A software product was assumed to be GILS-compliant, then it was suspected to be deficient. The service at GPO was for quite some time not GILS-compliant but it was heavily used, as the statistics posted to the list indicated (GPO personnel posted GPO Access usage statistics on a monthly basis from January of 1996 to February of 1999).

The GILS Forum hosted many announcements referring to the administrative development of new agency web sites. Agencies that used the GILS Forum to announce their sites included the Census Bureau, the Fish and Wildlife Service, the White House, university sites related to international environmental data, several GILS-related sites, vendor sites, conference sites, and even publisher web services. The GILS Forum carried announcements of conferences and research opportunities. Readers used it in part to keep track of Internet-related technology developments (Hammer, S. (1997, November 21). Subject: Re: NOT "by its nature this is an American list"). These are clues of communications occurring that are unconcerned with standards.

The Political System

This section is ordered by the concept of externalizations of the political system as developed by Luhmann (1990, p. 61). The political system is composed of the administrative, the public, and the political sub-systems. In relation to politics, the public expresses public opinion in a variety of ways including mass media reports, voting, surveys, and advocacy group communications. Public opinion may be in response to

political persons and politically developed programs. The administrative sub-system develops binding decisions in relation to itself and the public. These are expressed in such communications as public laws, regulations, and standards which themselves motivate political opinion. Politics produces political persons and party platforms which both shape and limit potential solutions (p. 48-49).

Typically, the Federal government is described as organized into three parts, the legislative, the executive and the judiciary. The legislative creates laws, administrators (bureaucrats who work in executive branch agencies) implement the laws passed by the legislative and signed by the chief executive, the president (Wilson, W., 1887). The judiciary judges the constitutionality of those laws. The three together are described as operating as checks and balances on the power of the federal government (as developed in the U.S. Constitution).

A description driven by Luhmannian theory sets aside (for the moment) this organization for government, replacing it with a functional description, one that focuses on the functions of a differentiated political system. The political system as a system distinguishes itself from its environment. Within the political system, its three sub-systems (the political, the administrative, and the public) distinguish themselves and function in relation to each other.

Given the communications of the political system suggested in the chronology presented earlier in Chapter 5, one may suspect that public opinion, laws, and persons are an oversimplification of the systems of communications in place. Luhmann suggests this himself (1990b, p. 63-64). In spite of this suggestion, he describes them as "smooth-

working, tried and true mechanisms . . ., [as] successfully tested principles." He asserts, however, that they are not the only correct principles and that theory may provide other possibilities (p. 64).

The differences among the political sub-systems and between the political system and its environment are developed and are expressed in highly stylized communications which are constrained by long practice and the functions of the system or particular sub-system. These sub-systems affect each other and develop in relation to each other. Rather than operating in hierarchical order, an order in which all decisions are made at the top and communicated downward, these systems function in a more cyclical and counter-cyclical manner (p. 50-51).

The Political Sub-System

This sub-system has to do with the communications of political persons, with political parties, and with their responding to and shaping public opinion. Political parties order their communications in relation to programs and to distinctions made in relation to their minority or majority standing. This is how it worked for crafting the Paperwork Reduction Act of 1995, the first law passed by Congress mandating the implementation of GILS. Congress had since 1989 considered various versions of bills to reauthorize the Paperwork Reduction Act. Initially, the incentive for this legislation was to continue funding for the Office of Information and Regulatory Affairs (OIRA). OIRA, however, was under intense criticism from Democrats who complained about how it managed its regulatory review process. Democrats attacked OIRA for operating in secrecy and using other strategies they described as preventing the public from reviewing proposed

regulations. During the first Bush Administration, the criticism of Democrats centered on Vice President Dan Quayle's Council on Competitiveness which from 1989 to 1993 filled the vacuum caused by the lack of Congressional support for OIRA and endeavored to control the regulatory work of agencies.[28]

By 1994, the Senate was satisfied with the bill that had been crafted by combining two Senate bills and with the assistance of the Office of Management and Budget (which contributed guidance from its Circular No. A-130 and the work that was already accomplished on GILS) and the General Accounting Office (which contributed a frequently praised report on best practices, *Improving mission performance*, 1994). Although passed in the Senate, the bill failed to be reported out of committee in the House where it died at the end of the session.

Slightly modified versions of that bill were introduced at the beginning of the 104th Congress. In the Republican-dominated House, H.R. 830 (the Paperwork Reduction Act of 1995) was introduced as part of the Republican Contract with America (141 Cong. Rec. S1218, Statement of Senator Roth).[29] In the Senate it was introduced as S. 244. It quickly passed both chambers with minor revisions and was signed by the President.

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[28] The descriptive terms here are taken from H. Rept. 104-37 which was written under the direction of Republican representative William Clinger.

[29] The Contract with America was the Republican initiative in the 104th Congress to bring sweeping reforms to how the Federal government conducted business. The Paperwork Reduction Act was one of only three bills signed into law during the first year of the Republican initiative (Hosler, 1995). It had been identified as a part of the Contract with America initiative by Newt Gingrich during the political campaign leading to the election of representatives for the 104th Congress (September 22, 1994, 140 Cong. Rec. H-9526-9529).

Legislators from both chambers and both parties praised it for having attracted bipartisan support and minimized the historic differences between Democrats and Republicans about how the 1980 act had been implemented. Members of both parties praised the sponsor of the original Paperwork Reduction Act, Lawton Chiles. Republicans praised those who had worked so long to bring the bill to passage, including the General Accounting Office and OMB, and Democrats praised the Clinton National Performance Review initiatives. Only a few Democrats continued to voice concerns about overturning the *Dole* decision.

Another incentive to consider reauthorizing and amending the Paperwork Reduction Act of 1980 was the Supreme Court decision, *Dole v. United Steelworkers of America* (1989), which removed from the review of the Office of Management and Budget any agency regulatory requirements that the business community post warning labels or workplace hazard information.[30] Until early 1995, Democrats spoke for the

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[30] Third-party disclosure requirements did not require that the public provide information to an agency; rather, it required that a non-governmental body pass information on to others, the intended beneficiaries of the information. The Supreme Court case which definitively removed third-party disclosure requirements from the coverage of the Paperwork Reduction Act was *Dole v. United Steelworkers of America*; S. 244 overturned this decision (p. 23, 36, 38, 62).

The case arose as a result of the 1987 Occupational Safety and Health Hazard Communication Standard. Businesses described these requirements as burdensome; workers, however, and their unions described it as a worker-protection and right-to-know issue. The United Steelworkers, representing workers in chemical plants, took the case to the courts. In spite of an amicus brief written by the original author of the Paperwork Reduction Act, Lawton Chiles, the court determined that the Office of Management and Budget did not have the authority to prevent the posting of hazardous material warnings in the workplace.

Other examples of third-party disclosure requirements cited in this report include "Federal requirements for labeling, self-certification, public recordkeeping, conveying information between third parties (such as pension data a Federal agency requires employers give their employees); and directly conveying information to State or local governments" (p. 12). The House committee argued that agencies were using third-party

interests of workers and for public protection. Republicans spoke for the interests of the business community. Democrats railed against the possibility of the Office of Management and Budget becoming a "superagency," one that was able to in secret wield arbitrary power over the regulatory agencies (141 Cong. Rec. H2021-2022, Statements of Representatives Collins, Doyle, Green). Republicans argued for controlling the amount of paperwork imposed on business, whether it involved completing a form or maintain records as part of a self-certification process (141 Cong. Rec. H2022, Statement of Representative Clinger). These kinds of issues characterized the Congressional response to the Dole decision from as early as 1990 (Kriz, 1990).

Information resource management was a frequently referenced concept in the report accompanying S. 244 (S. Rept. No. 104-8). This report included a definition for information resource management: "the process of managing information resources to accomplish agency missions and to improve agency performance including the reduction of information collection burdens on the public" (p. 18). It tied this definition with the requirement of the Government Performance Results Act (Pub. L. 103-62) and with the GAO report on best practices.[31] It included recommendations that agencies integrate the

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disclosure requirements to bypass the paperwork reduction procedures of the Paperwork Reduction Act. H.R. 830 was described as again putting those requirements within the paperwork clearance process, but with the added benefit of new public review procedures.

[31] That report was GAO/AIMD 94-115, *Improving Mission Performance Through Strategic Information Management and Technology*, which was released during a hearing of the Committee on Governmental Affairs, May 19, 1994. This report was a compilation of information resource management best practices gathered from government and business.

management of information technology with strong leadership and the involvement of line managers and the public.

Finally, the Government Information Locator Service is referenced. It was to continue the objectives of the Federal Information Locator System (FILS) to identify duplicative collections of information, required by the original Paperwork Reduction Act of 1980 (p. 54). It was also to promote public access to government information resources, first through available channels, but eventually through direct access by the public via the Internet (p. 26), including access through the Government Printing Office Locator established by the Government Printing Office Electronic Information Access Enhancement Act of 1993 (p. 55).

Senator Glenn, a Democratic member of the committee, included a minority view of Senate. Report. No. 104-8. He argued that the report provided a less than accurate representation of the history of the implementation of information resource management by the Office of Management and Budget. He listed the areas OMB slighted in its efforts to accomplish its paperwork clearance endeavors: statistics, records management, information technology management, privacy and security, and other unnamed aspects of information resource management. He referenced the Senate Report No. 103-392 from the previous Congress (when Democrats were in the majority) as being a more accurate description of the history of OMB implementation of the Paperwork Reduction Act (p. 59-60). The 104th Congress had a Republican majority; the 103rd, a Democratic majority.

The Administrative Sub-System

In contrast to the political communications described above, the administration communications involved building services, completing tasks, accomplishing projects, making visible the elements of the State in relation to political and public communications (to be discussed later). The Paperwork Reduction Act was finally passed after years of administrative work. Congress began to consider bills in 1989 and continued that work until the Paperwork Reduction Act of 1995 was passed and signed into law. Various committees held hearings to gather comments on the various bills under consideration and on the effect of both the work of the Office of Management and Budget and the *Dole* decision.

By 1994, the General Accounting Office had issued its report on best practices (*Improving mission performance,* 1994). This report summarized best practices collected from the business community and offered them as management solutions to government agencies. Congress had by this time also passed the Government Performance and Results Act of 1993 which required performance-based evaluation of government work and linked that to budgetary decision-making.

Jay Plager of the Office of Management and Budget had revised its Circular No. A-130 providing executive branch agencies updated guidance on the management of information technology and government information in electronic forms. His office had funded research on the development of GILS and had participated in the development work of the interagency Solomon's working groups and the Information Infrastructure Task Force. The Clinton Administration had introduced its National Performance Review

which made the use of information technology for accomplishing government work a priority.

This administrative work contributed to the development of the Paperwork Reduction Act of 1995 which included a legislative mandate to develop GILS. The House Report (H. Rept. No. 104-37, 1995) accompanying House Bill 830 (1995) described GILS as follows: "The section [3511] is amended to update the FILS requirement and transform it into an attainable goal." FILS had been designed to reveal paperwork duplication. Although it was hoped by some that GILS would also accomplish this *(OMB's Office of Information and Regulatory Affairs*, 1994),[32] GILS was often described as a kind of card catalog for locating government information rather than locating duplicate paperwork requests.

The arguments set forth in House Report No. 104-37 built on a series of earlier legislation,[33] on the testimony and support of persons (both experts from the private sector

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[32] By 1995, even Glenn had shifted his rhetoric about GILS away from discovering duplicate paperwork. He described its purpose in 1995: to "establish information dissemination standards and require the development of a Government Information Locator Service to ensure improved public access to Government information, especially that maintained in electronic format" (141 Cong. Rec. p. S3509, Statement of Senator Glenn). In another speech he stated that agencies were responsible to "conduct their dissemination activities in such a way as to ensure that the public has timely and equitable access to public information. A major element of this obligation is the mandate to make information available on a nondiscriminatory and nonexclusive basis so as to avoid disadvantaging any class of information users. Public information is public." In addition, he described the purpose of GILS in the legislation: "to ensure improved public access to government information, especially that maintained in electronic format" (141 Cong. Rec. p. S5277, Statement of Senator Glenn).

[33] These include the Federal Reports Act of 1942, the Federal Property and Administrative Services Act and its amendment (1950, 1962), the Budget and Accounting Procedures Act, the Brooks Act, Privacy Act, Clean Air Act, the Government

who spoke before committee hearings and politicians who supported and argued for this and earlier legislation), on hearings (especially several from the early and mid-1980s which investigated the role of the Office of Management and Budget and the responsibility of government to disseminate its information to the public[34]), several General Accounting Office reports, a few executive orders, OMB Circular No. A-130 and its revisions, magazine articles, research reports, and a National Performance Review report of the Clinton Administration. Its argument in support of H.R. 830 placed this legislation in relation to previous communications of government. General Accounting Office reports

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Performance and Results Act, the Computer Matching and Privacy Protection Act, the Freedom of Information Act, the Chief Financial Officers Act, the Federal Acquisitions Streamlining Act, the Administrative Procedures Act, the Regulatory Flexibility Act, Clinical Laboratory Improvements Act, the Anti-Trust Civil Process Act, the Federal Trade Commission Improvement Act of 1980, Pub. L. 89-306, the Copyright Act, and the Paperwork Reduction Act of 1980.

[34] Of particular importance (as it was cited frequently by legislators) was the Information Policy Report written by the House Subcommittee on Government Information, Justice, and Agriculture, *Electronic Collection and Dissemination of Information by Federal Agencies: A Policy Overview* (1986). This document explored various strategies agencies had used in the early 1980s to repackage their information into electronic databases and make them available to the public. Most employed the services of information service vendors. Most made their information available to the public for a fee (although some argued that by providing access free of charge in agency reading rooms located in Washington, DC, they were providing equitable access to all).

Issues agencies needed to consider when designing electronic agency information services included notifying the public before making decisions that changed how they provided information, avoiding direct competition with private information vendors, avoiding censoring any one user or group of users, ensuring equity of access and timely access, providing free or low-cost access to the public (charging only the incremental costs related to providing that access to users, not for recovering the costs associated with constructing the database), ensuring the security of agency computer systems (protecting the privacy of individuals who provided that information), and avoiding monopoly controls by government or by private vendors (including the ability to censor, copyright, or otherwise control how information was used).

were particularly evident in this report, several being referenced more than once and one in particular, *Improving Mission Performance* (1994) being included in summary form in an appendix to the report.

Senate bill S. 244 and House bill H.R. 830 were not identical; therefore a conference committee was selected to reach agreement between the House and the Senate bills. This committee produced the conference report, House Report No. 104-99. This report contained the text of the bill as agreed to (p. 1-26) along with explanations for decisions made by the committee members to bring the two bills into agreement (p. 27-39). This report reflected no debate, no argument, no overt deal-making, no party interests. It reported decision-by-decision agreements of the conferees, often with a brief rational to support each decision. It reviewed the legislation section by section, stopping at the points of difference between the accepted versions of the bill. At these points of difference, both versions were summarized, then the report noted which chamber receded, leaving only one version of that section in the final conference committee bill.

The explanations varied from decision to decision. Sometimes an addition made by a chamber was retained; other times the chambers agreed to discard the addition. For example, the House included a numerical definition for a small business, 50 or fewer employees. The Senate version contained no such definition. The House receded in spite of the stated importance of protecting small businesses from overburdening paperwork (this brief statement can be observed as a communication to divert negative public opinion, a political rather than an administrative communication). The conferees noted that the Small Business Administration was previously authorized by the Small Business Act to

set that definition, and that the practice of Congress was to generally avoid the inflexibility inherent in a statutorily set standard.

Again, this document referenced one law after another, setting the Paperwork Reduction Act in relation to previous statutes which serve as structural communications, decision-making schemata which constrain this communication.[35] The list of laws varied slightly from that included in the House report. The conference committee submitted its report on April 3. On April 6, both chambers agreed to it, and on May 22, 1995, it was signed into law.

In addition to this legislative/administrative work, there was, of course, the work accomplished on the GILS Forum and among agency personnel participating in various interagency initiatives to develop strategies for disseminating government information via the Internet (these included the Solomon's Group, the Information Infrastructure Task Force, and other Clinton Administration initiatives). List members participated in the development of the GILS Profile and discussed ways to implement GILS at the record level.

The OMB Bulletin imposed a deadline of December 31, 1995, for creating GILS records and making them available to the public. The Forum communications reflected

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[35] The laws referenced include the Brooks Automatic Data Processing Act and the Computer Security Act of 1987 which both amend the Federal Property and Administrative Services Act of 1947, the Prompt Payment Act Amendment of 1988, the Federal Acquisition Streamlining Act of 1994 which amends the Property and Administrative Services Act of 1949, the Small Business Act, the Administrative Procedures Act of 1946, the Inspector General Act of 1978, the Chief Financial Officers Act of 1990, the Antitrust Civil Process Act (1962), the Federal Trade Commission Improvement Act of 1980, and of course, the Paperwork Reduction Act of 1980.

response to the requirement that agencies comply. The EPA held several focus group meetings with constituents and announced its prototype GILS service in early November, describing it as being responsive to the requirements for GILS and the interests of EPA constituents. The agency planned to have a fully operational system by the OMB-imposed deadline. Other agencies used different strategies for completing the GILS project. One technician asked for advice about viable strategies to implement GILS in mid-November (Li, D. (1995, November 13). Subject: Question about GILS Implementation). Within a few days, after collaborating with GILS developers, he offered to help others working with a similar server and the same deadline (Li, D. (1995, November 27). Subject: GILS Implementation Note) (Li, D. (1995, December 13). Subject: Offering to help in setting up GILS Record Entry System). OMB extended the deadline by 30 days because of the government shutdown in November and met that deadline itself by announcing the availability of its GILS records in late January of 1996.

As a task, GILS was a complex constellation of identifiable characteristics (Luhmann, 1990b, p. 85). It was motivated by binding decision. It's particular characteristics (record structure, conformance with standards, and other similar details) were identified in these communications. Judgments of conformance related to matching those standards with the characteristics of the GILS records. GILS as a task also had identifiable boundaries. That which was GILS conformed to those record structure definitions; that which was not GILS did not. GILS also had a start date (December 1994 when the GILS Application Profile was issued) and an end date, the deadline imposed by the Office of Management and Budget. Agencies signaled their compliance with

announcements of the availability of their GILS records via the Internet. The resulting service was an assessable product.

The OMB deadline and other OMB guidance could be considered a kind of steering by OMB of executive branch agencies: OMB ordered agencies to construct GILS records by December 31, 1995. This could be understood as causing the establishment of GILS. Steering, however, is not that simple when considering it from the differences that appear for systems and their environments. Steering, according to Luhmann (1997), is not a process of making a system go where you want it to go. Rather, it involves a system (or an organization, in this case an executive branch agency) changing its structures by means of its own operations (p. 45). It can incorporate into those operations external advice, but it manages its own distinctions in order to reduce difference (as, for example, the difference between how an agency has indexed its own information systems on the one hand and the requirements of the GILS Profile, FIPS Pub 192, and OMB Bulletin 95-01 on the other). Each agency reduced that difference by means of its own operations.

The outcome of these operations, as observed by those who have evaluated GILS, was difference: one agency's implementation of the regulatory requirements was different from another's, producing collections of records that were very different in character. The Department of Defense constructed a GILS record for each publication, resulting in hundreds of records in place by the deadline; other agencies produced only a handful of records describing major information systems.[36] All of these agencies operated in reference

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[36] Many agency locator records can be browsed at GPO Access, http://www.access.gpo.gov/su_docs/gils/agency-pointer.html. GPO Access hosts the records of many agencies and provides pointer records to other agency GILS services.

to the same guidance, but they each implemented GILS according to their own operations. They described their own resources in their own agency-specific terms, not, for example, how a librarian would, applying standard cataloging rules to a collection of publications. Thus, the locator records of each agency at GPO Access reflect an implementation unique to the agency producing it.

During the early months of the GILS Forum a new list member asked questions about who had GILS servers, how to access them, and what GILS records describe (this message is reproduced in Appendix E). These questions were similar to other questions posed on the list. Here they serve an opportunity to observe in more theoretical terms how questions functioned on the GILS Forum.

According to C. Wright Mills (1940) questions emerge in the presence of alternative or unexpected programs (p. 905). These questions elicit other verbal expressions; questions are elements in conversations, or as Luhmann might has said, questions are among the communications that contribute to sustaining the autopoiesis of a communication system. Communications precede questions; questions are communications; and communications follow questions.

Being confronted with the need to provide services directs attention toward ignorance about how to provide those services. Multiple possibilities emerge in the environment of the communication system; none have greater advantage over others. A representative of the organization is charged to ask questions with the expectation that further communications will contribute to making selections from among available

possibilities for solving the problem of how to provide services.[37] The questions use vocabulary that indicate social controls and express an awareness of anticipated consequences. Anticipated consequences named in these questions included using technology, employing GILS-compliant Z39.50 servers, and planning for centralized GILS gateway among other "terminal phases" (Mills, p. 905-906). This vocabulary constrains possibilities: public service announcements on radio and television and ink-on-paper pages containing lists of GILS records bound into volumes are not among the available selections, given the questions asked here, although these strategies had been used by government for other projects. The social relations of government, OMB guidance (Circular No. A-130), interagency development work, developing network technology and public expectations that government agencies will make government information available via the Internet motivated these questions.

The motives (as they are circumscribed by their social situation) are unquestioned. These are "working vocabularies of motives" that, according to Mills "have careers that are woven through changing institutional fabrics" (p. 909). These are not something psychological or even subconscious. Rather, motives are communications which can be checked empirically by other communications. For Mills, the verbalized motive is "a basis of inference for a typal vocabulary of motives of a situated action" (p. 909). To find the

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[37] For this particular set of questions (Paulk, J. (1994, November 2). Subject: GILS Servers), no messages on the GILS Forum provide a single solution. Instead, the list moderator refers to the archive containing all of the messages posted on the Forum. It is possible that the one who asked the questions also received telephone calls, met with other developers, and received written descriptions of other GILS implementations, but none of those are referenced on the GILS Forum.

"real motive" one can only check for the controlling speech form presented in the act or series of acts (p. 910). In Luhmannian terms, situated action is not the object of observation; communications are. For Luhmann, action is an attribution of a communication system (1995, p. 112). It is constituted in the communications of the social system as a mechanism for reducing complexity (p. 137). Therefore, Mills' actions are communications which have been defined by social systems as actions.

For Paulk and for others who asked similar questions of the members of the GILS Forum, the situation was the need to construct an information service that could satisfy the requirements of the GILS Application Profile. This need emerged from the developing constellation of communications about how the government managed its information resources in relation with the developing technology of the Internet and the changing expectations of those who used the Internet.

Since GILS was largely determined by internal agency decisions (how records are created, how they are stored, what software to use), the communications of Paulk's agency, the Office of Scientific and Technical Information (OSTI), constrained the selections available to this particular technician. These include the historic mission of OSTI to disseminate scientific and technical information. The solutions available to the Central Intelligence Agency (which has an entirely different mission) were not adequate for an agency established to collect, organize and disseminate scientific and technical

information. Nor would the CIA have found OSTI's decisions to build and maintain their own GILS adequate solutions.[38]

The Public Sub-System

In contrast to the political the administrative sub-systems, the public sub-system produces public opinion. This public opinion develops in relation to political persons, party platforms, and binding decisions. It is expressed in opinion polls, voting, letters to the editor or to legislators, and testimony delivered during congressional hearings along with other strategies available to the public. For the GILS project, communications of technical developers and librarians via the GILS Forum and GILS-related conferences as well as various evaluations and media reports provided strategies for the expression of public opinion.

From 1989 until 1995, several bills were introduced in both the House and the Senate to reauthorize OIRA and update the Paperwork Reduction Act. They were criticized and commended by business people, librarians, bureaucrats, and legislators for their varying expected effectiveness in relation to either managing information in a rapidly changing information environment or managing regulatory review after the *Dole* decision.

The business community, represented by such organizations as the Chamber of Commerce, the National Federation of Independent Business, Small Business United, the Council on Regulatory and Information Management previously known as the Business

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[38] The CIA eventually contracted with the Government Printing Office, to maintain and make available its GILS records. This solution, to take advantage of the technical expertise of another agency, would not have been available to OSTI, an agency known for developing its own technological and scientific expertise.

Council on Reduction of Paperwork, Citizens for a Sound Economy, (*Hearing on restraining paperwork burdens,* 1991; *The Paperwork Reduction Act and its impact,* 1993; *OMB's Office of Information and Regulatory Affairs,* 1994), spoke in favor of overturning the Dole decision by legislation and passing the legislation during the 103rd and the 104th Congresses. They were also solidly in favor of controlling the impact of government paperwork (the regulatory burden) imposed by regulatory agencies. Those giving testimony provided stories about the cost of various regulations and government forms. Some reported that the crushing burden of government paperwork was forcing some small businesses to close their doors. They pleaded for a reduction of the paperwork burden.

In reference to the development of GILS and its place in the legislation under consideration, Gary Bass of OMB Watch testified before a Senate committee. He predicted that GILS "could be helpful for identifying what information there is, as well as many [other] issues. . . . If we have an effective locator, the public, all publics, whether it is the public interest, whether it is the business community, whether it is State and local governments can really begin to identify what kinds of information collection and regulatory requirements we all face" *(OMB's Office of Information and Regulatory Affairs,* 1994, p. 48).

Members of the general public also participated in the GILS Forum, but minimally. The forum tended to have debates that were highly technical, leaving those without technical skills unable to participate. However, membership to the forum was technically open to the public. It was directly supported by the Coalition for Networked Information,

a coalition of libraries and educational organizations. Meetings of the GILS Subgroup of the Open Systems Environment Implementors Workshop (OIW) were open to the public as well. Examples of communications that involved public participation included a December, 1993, meeting hosted by OMB Watch, the Implementors' Forum held in September, 1995, and the two-day GILS Conference held in November, 1996.

Finally, the public was represented by what participating agency personnel knew about their own interactions with members of the public. Their own agency information products were shaped in part by their work in relation to those publics. OMB guidance (Memorandum M-95-22, for example, 1995) required that agencies consult with their public in the design and development of information services.

Summary

This chapter has reviewed in chronological order the development of both the Federal Information Locator System (FILS) and the Government Information Locator Service (GILS). Both information systems were mandated by the Paperwork Reduction Act, but their priorities were very different.

For FILS, the purpose stated by both legislation and legislative reports (Commission on Federal Paperwork, 1977) called for an information system that would reveal duplicate paperwork requirements. For GILS, the priority contained in the legislation was to provide a mechanism by which both agency personnel and the public could discover information available from government agencies.

The bipartisan goal of the 1980 Paperwork Reduction Act was to reduce the burden of government on the public. Representatives of business interests testified in

congressional hearings about the burden and resulting costs to the business community for filling out government paperwork, much of which was linked to agency regulations. Part of the goal for the 1986 amendments and reauthorization of the Paperwork Reduction Act was to enhance the value of that collected information by encouraging the dissemination of government information. Regulatory control and review were centralized processes, taking place in the Office of Information and Regulatory Affairs (OIRA). Agency personnel submitted proposed paperwork forms to OIRA. OIRA desk officers checked those forms for possible duplication of paperwork and approved, denied, or returned the forms to the agencies for revisions.

The Paperwork Reduction Act of 1980 was crafted by legislators affiliated with either the Democratic or the Republican party. The decisions of the Republican Executive concerning the implementation of the Paperwork Reduction Act (executive orders and other mechanisms for establishing priorities in the Office of Management and Budget) perturbed Democrats as they formed their critical responses, and Democratic criticism perturbed Republicans who formulated responses.

The public demanded a reduction of paperwork and an increase in the availability of government information. The Office of Management and Budget, perturbed by both politics and the public, developed guidance (OMB Circular No. A-130 and other guidance) that constrained the administrative work of government. Congress contributed to this administrative work with its own guidance to agencies, either in documents which reported congressional intent or legislation mandating specific agency actions.

By the late 1980s and early 1990s the topic of debates had shifted significantly. Communications concerning regulatory control of the public gave way to communications about providing public service. Public concerns for the burden of government on the public shifted to concerns for receiving the benefits of information collected by the government in efficient and effective ways. Legislators, agency personnel, and the public described the value inherent in government information.

Responsibility for checking duplicate paperwork burdens, which was a highly centralized Office of Information and Regulatory Affairs (OIRA) process during the Republican Reagan and Bush administrations, was decentralized during the Clinton Administration. Agency personnel checked for already available information with other agencies and developed information collection forms in collaboration with members of the public before those forms were submitted to OIRA.

The Office of Management and Budget and others funded research to make that information more available. By 1995 when the Paperwork Reduction Act was again reauthorized and amended, considerable administrative work had been accomplished to design, build, and describe the Government Information Locator Service.

The Political System produces binding decisions. For GILS, those binding decisions include the Paperwork Reduction Act of 1995 and the other communications which functioned as structural elements around which other communications were organized. These included OMB Circular No. A-130, OMB Bulletin 95-01, The 1994 vision document written by Eliot Christian for the Information Infrastructure Task Force, the GILS Application Profile (an international standard), FIPS 192 and 192-1, and NARA

GILS guidance. From these communications emerged GILS, a service that describes the information products of government agencies using Z39.50, an international standard for searching and retrieving information.

Chapter 6 concludes this dissertation. It considers the GILS project in relation to four research questions. It also includes a discussion of the significance of this research project and reflects on the use of Niklas Luhmann's theories and methodology within the discipline of library and information science.

CHAPTER 6
RESEARCH QUESTIONS AND CONCLUSIONS

This final chapter returns to the research questions first posed in the first chapter. Besides providing answers to these questions, I have described the process employed in this dissertation for discovering meaning. Question one, in particular, includes descriptions of the strategies used and the distinctions employed.

This chapter also includes a brief discussion of the challenges associated with conducting research using Luhmann's theory. It includes a discussion of the value of this dissertation to library science and concludes with a brief review of observations.

The findings here are developed by means of Luhmann's description of the political system (see in particular 1982, 1990a, 1990b) which distinguishes itself from its environment and functions by means of the binary in-government/out-of-government to express itself by means of power. It further differentiates itself into three sub-systems, the political, the administrative, and the public as depicted in Figure 6.1. These sub-systems express themselves by means of political persons and platforms, binding decisions, and public opinion and function most particularly in relation to each other. Thus, politics is informed by the public which expresses public opinion and the structures developed by administration; administration is informed by political platforms and persons and public opinion as it constructs the visible elements of government (policy, law, regulations, institutions, and agencies, for example), and the public is informed by political platforms and persons as well as the binding decisions and programs crafted by the administration.

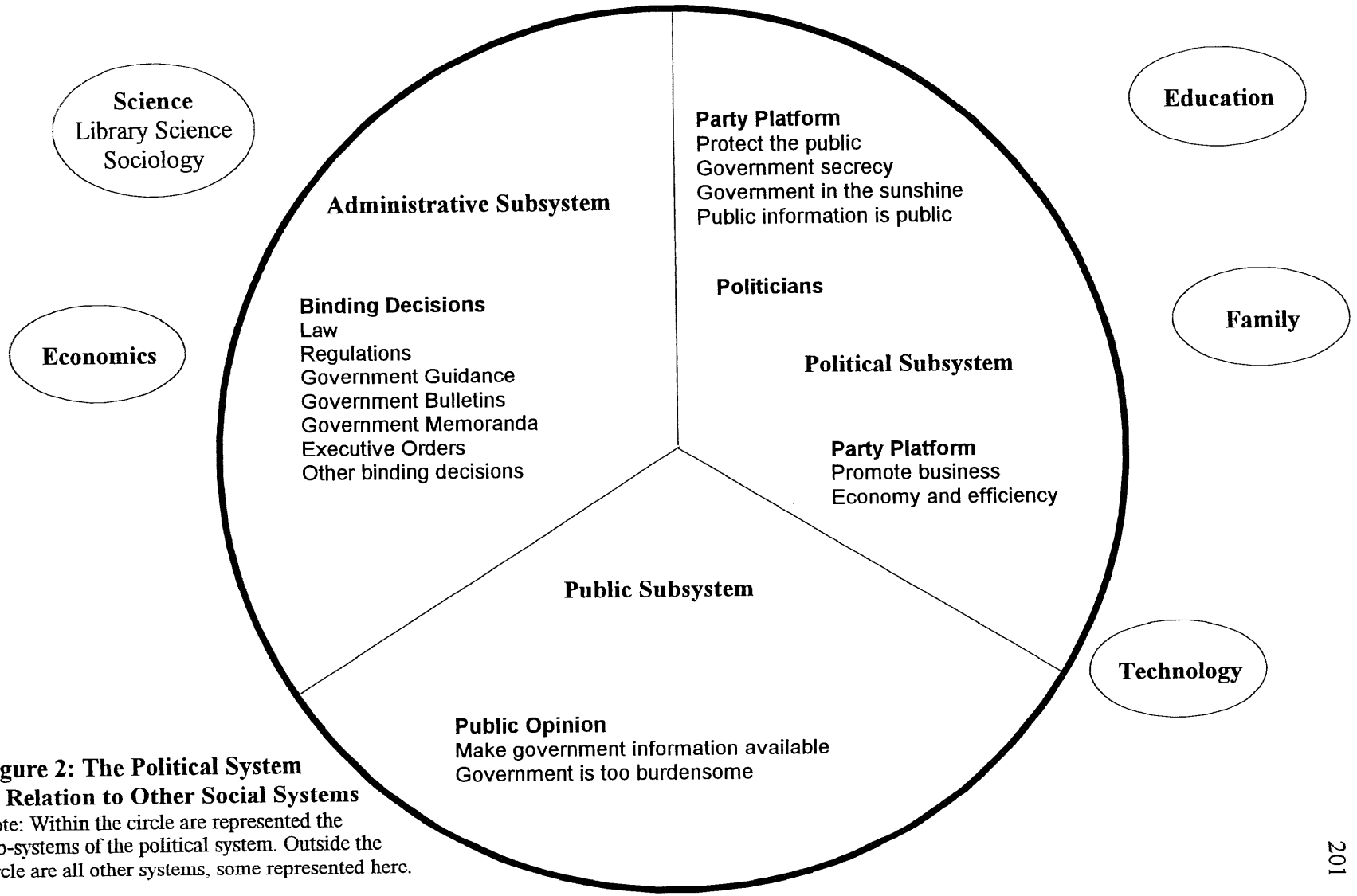

Figure 2: The Political System in Relation to Other Social Systems

Note: Within the circle are represented the sub-systems of the political system. Outside the circle are all other systems, some represented here.

Each of these sub-systems observes the other two sub-systems far more closely than they observe their environment. They ignore as environmental noise the communications of other social systems for the most part. As a system they are operationally closed–their mode of operations forms the boundary between the system and its environment. At the same time, they are open to being perturbed by information from their environment. They do not communicate *with* their environment; rather, they each communicate self-referentially within their own sub-system and in relation to the other two political sub-systems *about* their environment. This also means that when the political system communicates about communications of other social systems, it does so in political terms. Politics expresses party positions, the public expresses opinion, and administration expresses binding decisions.

Luhmann described the political system of the modern welfare state as a state that observes democratic practices; it includes the public in government and notices public opinion in the operations of government (1990b, p. 175). Characteristic of such a government is the requirement that information about government be available to the public. As James Madison wrote in 1822, "A popular Government without popular information, or the means of acquiring it, is but a Prologue to a Farce or a Tragedy; or perhaps both. Knowledge will forever govern ignorance; And a people who mean to be their own Governors, must arm themselves with the power which knowledge gives" (Hunt, p. 103). Senator John Glenn explained the intent of Congress for government agencies managing their information resources when he spoke about the conference report for S. 244, the Paperwork Reduction Act of 1995. Government agencies need to

> conduct their dissemination activities in such a way as to ensure that the public has timely and equitable access to public information. A major element of this obligation is the mandate to make information available on a nondiscriminatory and nonexclusive basis so as to avoid disadvantaging any class of information users. Public information is public (141 Cong. Rec. p. S5277, Statement of Senator Glenn).

"Public information is public." This is the late 20th century version of Madison's call to make information about government available to the public. The political public demands information about the work of government, and the government, perturbed by this demand, crafts a program for making information about its work available to the public. The administrative sub-system collects for itself as part of its regulatory responsibility the information from the nation, organizes it for its own purposes, and publishes it as a description of the nation. Examples include the decennial census and various business statistics. These communications perturb the public sub-system, motivating greater or lesser change in public opinion.[1]

GILS was an information system developed by government for providing access to government information in the early 1990s. It included the strategies for locating and gaining access to government information in all formats, including electronic forms distributed by computer networks. The research questions presented in Chapter 1 provide an opportunity to observe the operations that shaped how GILS was developed.

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[1] These communications are also found useful in other social systems in the environment of government (education, science, economics), but that is a topic for another study.

The Research Questions

Q. 1. How did the political system produce the systemically meaningful communications that constrained and facilitated the development of GILS (that is, what made government productive according to its own meaning)?

GILS emerged from the communications of the political system which was itself perturbed by other systems. It was a development of politics as political persons and parties crafted the party proposals for solving problems developed as technologies changed. It was a development of the administrative sub-system as legislative and agency personnel collaborated to produce binding decisions and to develop the visible product. And it was a development of the public as public opinion demanded that electronic government information be made available via the Internet.

Question 1 allows the exploration of the strategies government used as it made decisions about GILS. These observations are by means of the distinction-making strategies used by Luhmann for developing meaning. Therefore, the description of the development of GILS below is organized in terms of distinctions. I draw a distinction and make an indication. Then I describe what is observable using the communications about GILS as my data.

The first distinction considered here, that of time which operates with a before/after, was found in the chronologies of events (chapter 5). The next distinction, that of in-government/out-of-government is considered, but I select to first indicate the out-of-government side of the distinction. In the environment, I have described the economic system, which uses buy/sell operations, and the system of science, which discovers

true/not true. None of these systems (time, economics, or science) describes how government developed GILS. That requires returning to the in-government/out-of-government distinction and indicating the in-government side of the form.

Time

The first distinction has to do with time. Chapter 5 began with a chronology of events occurring in the last 60 years. The events selected for the most part were referenced by the communications related to GILS and drawn from the GILS Forum and the debates of Congress. A chronology, however, does little more that offer the distinction before/after. I observe that before 1980 there was no Paperwork Reduction Act and no Federal Information Locator System (FILS), and after 1990 work progressed toward GILS.

I observe that previous to the mid-1980s computers were used only for highly specialized projects like collecting and managing census data. After the mid-1980s, computers were more widespread, and by 1995, computers were nearly ubiquitous. Many computers were connected to networks and able to send and receive files across those developing networks. Government agencies, in conjunction with their mission, began to develop strategies for disseminating their information products in electronic formats via these computer systems. Laws were passed in the late 1980s and early 1990s requiring that agencies provide electronic access for particular information products.

Before GILS was designed, standards relating to electronic networks developed in the 1980s. The standard for the seven-layer OSI model was agreed upon as a *de jure* standard and the first version of Z39.50 was developed to operate in that environment.

TCP/IP was also developed in the 1980s as a *de facto* standard, and Z39.50 was tested and found to operate successfully in the early 1990s on the application layer of TCP/IP. After decisions were made about the characteristics of GILS, Netscape released its Internet browser and changed how people used the Internet.

Laws, technology, and standards were established in time. They were not available before, but provided structures within which to operate afterward. This before/after distinction does not reveal how government developed GILS, nor does it even reveal the significance of the details just presented. It does, however, make visible something about what was and was not yet available to government early in the development process, what became available to government later. To develop further meaning beyond this before/after distinction, I need to draw another distinction.

Economics

Drawing the distinction in-government/out-of-government and selecting the out-of-government side of the distinction, I observe incomprehensible complexity until I draw yet another distinction, that of buy/sell, the distinction used by the economic system. In doing this, the in-government/out-of-government distinction fades from view as unimportant for the moment.

Businesses operate in the economic system using this buy/sell distinction or something related to it (as with profit/loss kinds of communications). In testimony before Congress, business people described complying with government paperwork as a questionable business expense, one that cut into profits without demonstrating a clear value they could identify as a worthwhile return on investment.

Besides describing government as costly, businesses also observed government as a potential market and an opportunity for profit. Many businesses profited during the 1980s from managing and selling electronic government information resources. These businesses observed government attempts to make its information directly available to the public as potentially threatening to their profits. They described government as practicing in unfair competition with business. Yet some businesses saw profit opportunities in developing products and services to facilitate the delivery of government information to the public.

Businesses also participated in the development work of GILS conducted via the GILS Forum. Representatives from technology companies monitored the development of the GILS Application Profile, tested it against their software products, and developed software that was compliant with Z39.50 and the GILS Application Profile. They developed software products that automated the creation and management of GILS records. They developed Z39.50 servers and sold them to government agencies for managing vast collections of documents. These services let users conduct searches and retrieve the documents that met the search criteria.

Government-produced GILS records were a low-cost (or free) collection of diverse records, readily available for testing the capabilities of newly-developed Z39.50 client-server software products. Using government-produced records, companies tested and discovered how well their software products performed on the Internet. Companies like Lexis-Nexis developed services that took advantage of Z39.50 technology and used

government-produced information products to deliver value-added information services to their customers.

For the economic system, political communications about the democratic operation of government were noise in the environment. Such communications had nothing to do with profits and losses for software developers or information vendors. In economic terms, GILS was raw material for developing a product that had the potential for profit. These companies did not develop GILS as a marketable product itself; rather, they developed the information management services and software products for managing information, and they used GILS as a research and development laboratory.

Science

Drawing another distinction (still within the environment of politics), I observe that information scientists studied government information management strategies. They recommended information science discoveries (truth, as that is how science functions) as solutions for how government should manage its information resources, including employing Z39.50 to search and retrieve government information products.

They developed the standard Z39.50, and discovered that it would operate successfully on a computer network that used TCP/IP rather than the more complex OSI standard. Z39.50 worked with a complex record structure called MARC (machine readable cataloging). This record structure was developed by information scientists and used by librarians to describe the kinds of materials found in libraries. It was also designed to be transportable (Furrie, 2000). Because it conformed to Z39.50, a record created for one Z39.50-compliant cataloging system could be copied into and used by another

Z39.50-compliant cataloging system. One librarian could describe a book using MARC and then send a copy of that description via a computer network to a shared storage place. From that place other librarians could retrieve it for describing their own library's copy of that book.[2]

Information scientists recommended the same system for government information products. Perturbed by government, however, they developed a modified record structure for GILS, one that included fewer and simpler fields for the description of government information products. It also included newly created fields to accommodate demands particular to government for this project, including a local control identifier and availability information (McClure and Moen, 1994).

This work of information science, however, cannot stand as the definitive explanation for how government developed GILS because it is in the environment of government. At the most it functioned as a perturbation to government. If not observed as a perturbation, it was only noise from an undifferentiated and overwhelmingly complex environment.

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[2] OCLC is a non-profit corporation which manages a repository of MARC records known as WorldCat. These records are created by catalogers who work in libraries around the world. They search the WorldCat database and if they find a record describing the publication at hand, they copy it into their own local cataloging system. They may add additional information in consideration of the particular characteristics of their copy of the publication (signed by the author, for example) or the characteristics required for their library to serve its particular clientele (adding children's or medical subject headings, for example) rather than creating a new description of their own. Thus, the work of one cataloger is used many times and in many catalogs.

The Political System

Returning, then, to the distinction in-government/out-of-government, let us cross from the out-of-government side of the distinction (where time, economics, information science and librarianship operate) to the in-government side. This has been the major field of observation for this dissertation. Immediately I observe, according to Luhmann, three sub-systems within government: politics, administration, and public. Therefore, I draw another distinction in order to observe these one at a time in relation to each other. These sub-systems observe their own operations self-referentially in relation to the operations of the other sub-systems, and they react to perturbations from their environment according to their own operations.

Government noticed that business interests described government as burdensome and expensive, so expensive that it caused some businesses to fail. Politics, which involves party platforms and political persons, observed these communications as negative public opinion and responded in the 1970s by developing a political program, the Commission on Federal Paperwork, to investigate the problem (which itself engaged the administrative sub-system of politics). Later, politics mobilized legislative votes to pass the Paperwork Reduction Act of 1980 to implement (another reference to the administrative sub-system) the recommendations of the Commission.[3]

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[3] This act required that government reform the regulatory and paperwork process and establish a computer system that would identify duplicate requests for information. These requests were related to government regulatory operations. The two operations were considered inseparable during the Reagan administration.

In the 1980s, politics expressed itself in terms of a Democratic majority in the House, vocally and persistently criticizing the Republican Reagan Administration[4] for how it managed the responsibilities imposed by the Paperwork Reduction Act. The Republican Administration considered the political risk associated with asking Congress to fund a new information system (FILS) and chose to assign the project to the Department of Defense which had available both the technical expertise and the financial resources. Democrats, observing Republicans in relation to public opinion and administrative actions, labeled the Republican information management strategy as irresponsible. Democrats also described the Republican Administration's management of the regulatory process as a failure. The Republican Administration reduced the number of government publications to save money and encouraged economic interests to profit by selling electronic government information resources. Democrats criticized the administration for its actions, for operating in secret and for endangering the public by curtailing the free flow of government information products.

In 1989 the Democratic majority prevented the reauthorization of funding for the Office of Information and Regulatory Affairs (OIRA). This office was responsible for overseeing (rejecting, delaying, or approving) the regulatory paperwork created by executive branch agencies. Desk officers from OMB collaborated with the Republican

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4 Note that "Administration" here refers not to the Luhmannian administrative sub-system, but to the more colloquial sense of the term, the political president and the Executive Office, here the Republican president in relation to other Republicans in government (although not in the majority in the House of Representatives). To distinguish the two, I have capitalized Administration wherever I refer to this colloquial sense of the word and used a lower case "a" when I refer to the Luhmannian administrative sub-system.

Administration's Council on Competitiveness on regulatory management to continue the work that would have been accomplished in OIRA had funding been available. The Council on Competitiveness was chaired by Vice President Quayle and operated within the structures that set the Office of the Vice President apart from the more observable operations of administrative agencies. Democrats charged the Administration with operating in secret.

By the early 1990s, both parties were interested in promoting the availability of electronic government information products, but they were not yet in agreement about how to make it happen. In 1994, Republicans seized the opportunity to make the proposed Paperwork Reduction Act a part of its Contract with America initiative, and in 1995, the bill was quickly introduced, considered, and passed with broad bipartisan agreement. Both political parties took credit for this bill. It claimed the legislative history of the first Paperwork Reduction Act, sponsored by the Democrat, Lawton Chiles, and it was identified by Republicans as a component of the Republican political program, the Contract with America.

Republican political communications informed the management of programs and motivated Democratic political communications. Democratic political communications perturbed administrative operations and motivated Republican political communications. Both Republican and Democratic communications operated to construct political issues and options for the public.

In relation to this political action, the administrative sub-system of government built the elements and structures that made government visible. Personnel in the

Department of Defense constructed a database of information drawn from regulatory forms. They gradually constructed operations for searching this database and upgraded it to a new computer system to improve its operations. They released reports and worked collaboratively with the Office of Management and Budget (OMB) to move the database to the Office of Information and Regulatory Affairs where it could be used by desk officers to discover duplicate paperwork requests. Early in the 1980s OMB expressed optimistic predictions for the success of FILS and regret that it was taking longer than expected to implement. By the late 1980s, desk officers were not using FILS, having determined that it was a failed system and a faulty strategy. It was not used by OMB to discover duplicate paperwork, and no administrative efforts were initiated to fix FILS.

During the 1980s, OMB issued its information resource management policy document, OMB Circular No. A-130. This document provided executive branch agencies guidance on managing agency information resources and required (a binding decision) that they participate in the depository library program managed by the Government Printing Office. It constrained agencies to particular information management strategies. In 1989, the administrative sub-system discovered something about public opinion concerning the availability of electronic government information when OMB released its proposed revision to its Circular No. A-130 (1989, January). When OMB proposed that agencies continue to rely on information vendors to provide government information to the public for a fee, librarians, educators, and others strongly criticized government for not directly disseminating its own electronic information products. By April, OMB had withdrawn its

January proposal, and in June of that year, it offered a different proposal (which garnered more positive public opinion).

In the late 1980s and early 1990s, the Federal government began managing government information using computers. Networked information, however, created the problem of whether and how to disseminate electronic government information. Agency personnel described early collections of electronic government information as working files, not publications.

By the end of the 1980s, though, government was beginning to use these electronic collections in ways similar to their traditional paper publications, making them available to other government agencies and to the public. Agency technical personnel collaborated (in interagency working groups) to develop strategies for managing information using computers and for disseminating electronic government information. At congressional hearings they displayed collections of data on CD-ROM and collaborated with businesses and international interests to develop standards for operating computer networks.

The solution of opening access to government information via computer networks, however, created the problem of how to let the public know about these resources. Already available to the administrative sub-system as a pool of possible solutions were various indexes, bibliographies, and serial publications crafted in relation to existing law (agency bibliographies, the *Monthly Catalog of Government Publications* and others) and practice (a variety of agency locator systems) (see McClure et al., 1990; McClure, Ryan, and Moen, 1992). Complexifying the task was the Internet itself. It was a new

communications medium, so new that decisions were still being made about what it could become.[5] If agencies were going to disseminate their information products via the Internet, then a better indexing solution for these resources than traditional paper-based indexes might be "worth" developing. I use "worth" here in a metaphorical sense. It is not in relation to the economic distinction profit/loss, but in relation to the effect of developing binding decisions that work better in relation to the political and the public sub-systems. A better (modern, information age) index had the potential for complementing political party communications and generating positive public opinion.

Drawing on the model presented by its traditional solutions (indexes) and the technology of the Internet, the political system developed a solution for seeking electronic government information: a new kind of index, one that could search government information of all kinds–paper publications, electronic publications and databases, and human experts–and one that could be used by both government and the public via the Internet. Although considered a standard service in 2002, an electronic search service that made government information available to anyone using a networked computer was a revolutionary and amazing idea in 1993.

In the early 1990s legislators held hearings to develop a revised Paperwork Reduction Act, to hear public opinion about information policy, to discover new agency initiatives for publishing government information in electronic formats, and to explore possibilities for how they should respond to the Supreme Court decision, *Dole* v. *United*

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[5] Was it a research system for communicating scientific discoveries, or could we actually accomplish business transactions using it? Could it be used for education at all levels, or was it really appropriate only for post-doctoral research?

Steelworkers of America (a communication from the environment of politics and therefore a perturbation; it was a decision of the judicial law system which functions by the distinction legal/not legal). Interagency working groups collaborated to develop new information management strategies using new technological developments. Lead agencies like OMB and the General Services Administration funded research projects to discover and develop new information tools including the initial GILS Application Profile.

Legislators and their staff crafted the bill that finally became the Paperwork Reduction Act of 1995 (S. 244) along with its legislative history. That history set the act within the context of a constellation of other legislation and information management initiatives. Note that, although this work was accomplished in part by politicians, the crafting of the text of the law functioned as administrative work, producing binding decisions. This work is distinct from the political communications of political parties and political persons.

Agency personnel and other interested parties developed a *de jure* voluntary international standard, the GILS Application Profile (a binding decision). Many of the communications related to that work are preserved in an electronic mail archive, the GILS Forum. They were used as data for this project. That profile was accepted by the government as a federal information processing standard (a binding decision). Agency personnel created individual GILS records in response to OMB and National Archives and Records Administration guidance (OMB Bulletin 95-01 and NARA's 1995 document describing GILS records, field by field, themselves the result of administrative development work--binding decisions).

Many agency personnel who worked on GILS were also technical experts. For example, Eliot Christian and Steve Hufford worked on developing the GILS Application Profile on the GILS Forum. Christian, collaborating with other agency personnel, wrote the vision document that guided the development of the first version of the GILS Application Profile (Christian, 1994). He organized and archived documents related to GILS for those who contributed to the project and continues to maintain the documents related to GILS. He was often the Forum member who asked questions or offered suggestions leading from one part of the project to another. His 1994 document setting forth the vision for GILS was not itself an official document like an OMB bulletin or circular, a law, or an executive order; yet it *functioned* as a binding decision. It restated the vision of the Clinton Administration (Information Infrastructure Task Force, *Agenda for action*, 1993) and was referenced when answering questions or making decisions about what GILS should be able to do.

Hufford, who had developed an early locator system for the Environmental Protection Agency, organized monthly meetings in the Washington, D.C., area for those who collaborated to write the second version of the GILS Application Profile, build individual GILS records, and implement GILS services at the agency level. Much of the decision-making that shaped the end product (administrative work) occurred in these meetings and was motivated on the GILS Forum by the reports of these meetings posted there. Participants developed meaning in relation to questions about such concepts as simplicity and complexity, the usefulness of international voluntary standards, how GILS was like and not like other standards (such as GOSIP), whether GILS was a better or

worse solution than HTML and Internet search engines, and whether Z39.50 was or was not an appropriate standard for presenting government information on the Internet.

Questions, according to C.W. Mills, function as lingual indexes in conversations, indexes of motives and options (Mills, 1940, p. 905). As indexes of options, the questions asked on the GILS Forum revealed that more than one selection was available to the system. The answers offered for those questions on the GILS Forum revealed decision-making structures which constrained and facilitated productivity for the system. The *Agenda for Action*, Christian's 1994 vision document, the GILS Application Profile, the Paperwork Reduction Act of 1995, and other communications sorted possible from impossible answers and made visible the answers that complemented the administrative sub-system's own binding decisions. Figure 6.2 illustrates this concept. When the system selected the answer or possible answers to the question, it excluded available solutions at the same time it selected the chosen answer. The answer chosen reveals distinctions which carry meaning for the observer. The allowable answers reveal the constraints of the system, in this case, the binding decisions developed by the administrative system, including both legislative and agency action. Other answers were available in the environment of the administrative sub-system, but these were not chosen. That these decisions might have been otherwise further confirms that these communications functioned as decision-making schemata and constrained the communications that were possible within the administrative sub-system.

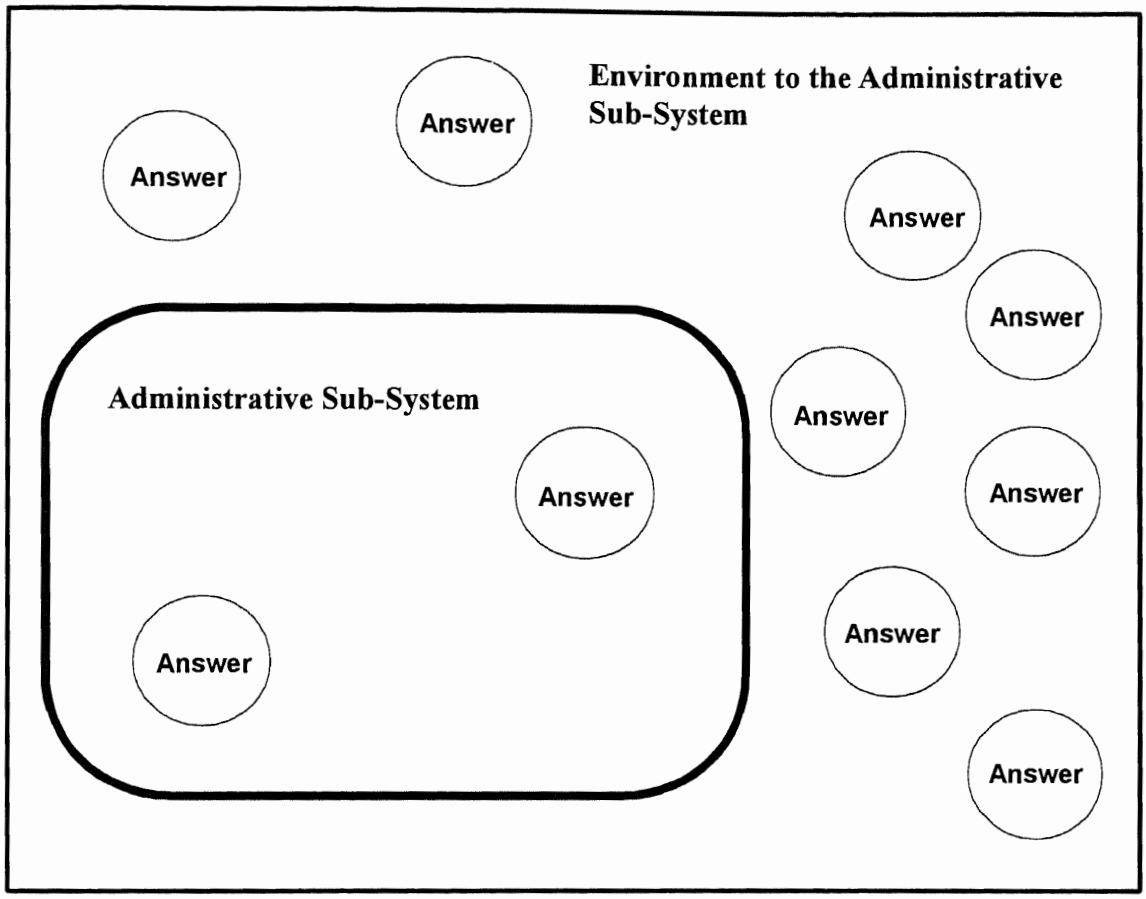

Figure 3: Binding Decisions of the Administrative Sub-System and Possible Answers in Relation to a Question.

Note: The binding decisions of the administrative sub-system (represented here as the area within the inner box) are developed in relation to the political and public sub-systems (not depicted). The answers available to this system are represented within the boundary of that inner box. Therefore, these few answers are the only answers available to the political system as a whole (including the political and public sub-systems, although they do not express themselves in terms of binding decisions). Many possible answers might have been available had they not been constrained by the structures of the binding decisions developed by the administrative sub-system, although it could have been otherwise.

The public developed its own communications in relation to the communications of the political and the administrative sub-systems. During congressional hearings, members of the public (librarians and business people, in particular) expressed their expectations about government services, including the provision of government information and information services. They complained about the cost and the inadequacy of procedures and services developed in response to the Freedom of Information Act. They complained about corporate control of government information by the information industry. They described information as a public good that should be freely available to the public and distributed to depository libraries across the country. They describe government information as beneficial for education and for business. As mentioned above in relation to the administrative sub-system, they criticized OMB's 1989 proposed guidance for managing government information resources (Office of Management and Budget, 1989, January 4).

The public also participated in the development of GILS and produced opinions about it. A few librarians participated in discussions on the GILS Forum. They communicated their opinion about GILS to agency personnel at such events as the GILS Conferences. Members of watch dog and public advocacy organizations provided persistent attention to the development of GILS, often hosting meetings, offering criticism, and evaluating the implemented service.

Question 1 also raises the issue of productivity. For Government, productivity is indicated by the government services that are visible and somehow useful. In Luhmannian terms, the political system is most successful (and this success refers to its productivity)

when it develops decisions that complement the themes of multiple systems (1982, p. 144-145). It is possible to observe this usefulness within government. For example, after years of effort, it was reported that the Federal Information Locator System (FILS) was not used. Scientific investigation revealed that FILS was ineffective and that a different kind of system would be more useful for locating government information (McClure, et al., 1990, p. 2). As a program, then, FILS was not productive. The investigators determined, however, that a computer system for locating government information had potential.

Do agency personnel use GILS to locate their own or another agency's information? Although this was not an objective of this dissertation, it became apparent from the communications I reviewed that some agencies still find GILS to be useful; others do not. However, during the development phase of the GILS project, personnel from several agencies participated in the decision-making conducted on the GILS Forum, and the continuing availability of several agency GILS collections demonstrate that government found GILS to be useful. Its development complemented politics, the public, and the administrative sub-systems.

This is demonstrated by an example of a government assessment. The Government Printing Office assessed its own program for making agency GILS records available. It was successful because it *provided access* to a search service available via the Internet by which users could successfully search and retrieve GILS records from a long list of government agencies. Evidence of this success includes the current search interface that GPO Access maintains as well as its reports of searches which were posted on the GILS Forum for several years. GPO was successful (productive). It was doing the work

assigned to it by law in a way that complemented the need of executive branch agencies to comply with a binding decision.

If productivity is a measure of whether a program or product complements the themes of multiple systems, however, evidence will be visible in relation to other systems out of government. For example, have librarians or business people found GILS useful?

Science assessed GILS (Moen & McClure, 1997) and found it to both succeed and fail. It was successful as an example of an early project implementing search and retrieval strategies on the Internet, but it failed because it did not achieve the vision of a virtual card catalog (as it was described in the Information Infrastructure Task Force *Agenda for Action* report, 1993).

In relation to the economic sub-system, some businesses that participated in the development of GILS (using the email discussions conducted via the GILS Forum) continued to produce software and information management services using the software strategies they developed for GILS. Blue Angel developed the GILS-compliant MetaStar Server and collaborated with Fulcrum Technologies to provide knowledge management software products for government and industry customers (Riewe, J.S. (1998, August 12). Press Release). Blue Angel produced software for managing government Internet portals (Molholm, K.N. (2000, April 26). Re: Building portal. . . advice/info needed). Other commercial software products mentioned on the GILS Forum as having developed capabilities in relation to GILS included Netscape Compass, Indexdata, Fretwell-Downing, WAIS, Isite, Oracle, Compusult, and Ultraseek (Christian, E. (2000, April 26). Re: Building portal . . . advice/info needed). Bookwhere was mentioned several times

throughout the life of the GILS Forum as client software for searching Z39.50 servers (see its first mention at Kelly, M. (1995, September 5) Windows Z39.50 Client available).[6]

Q2. How does the political system manage the perturbations of new technology in its environment?

Government responded to the perturbations created by technology in a variety of ways, including sponsoring scientific research, holding congressional hearings, developing binding decisions, and crafting political programs. Communications in the environment of social systems can be either ignored as noise or can cause irritations (perturbations) to the system. If perturbed, the system communicates about what disturbs it. Communications are not transferred unchanged from one side of this system/environment boundary to the other. Rather, the system notices the environmental communication and communicates within itself about the environmental communication.

Since the communications of the political system are related to the in-government/out-of-government distinction and to the development and application of power, technology itself is in the environment of the political system. Technology perturbed politics. The 1977 Federal Paperwork Commission reported that technology could revolutionize the management of government information, that a searchable database could wipe out duplicate government paperwork. Technology promised to solve intractable problems for government.

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[6] This dissertation did not include a requirement that I formally collect data concerning whether librarians found GILS useful. I have out of curiosity asked government documents librarians whether they used GILS. I have not found any who do, although one suggested that GILS records contained useful information.

Yet technology also created intractable problems. In the 1980s and 1990s as computers became widely used in government agencies for managing and manipulating information, the distinction between internal agency files and agency publications became muddled. Public opinion called for access to electronic government information which in the early 1980s was understood within government as "internal agency files." Yet, agencies began in the mid-1980s to develop information products they delivered in electronic forms to the public. This motivated the administrative work of investigating the binding decisions that either promoted or prevented such access (See *Electronic collection and dissemination*, 1986). Examples of an intractable problem are the GOSIP standard (which proved to be more complex and more expensive than other technological solutions) and FILS (which proved to be too complex a problem to solve with current technology and with the legal requirements imposed on agencies to protect privacy). Both were finally discarded by government.

The Office of Management and Budget sponsored three scientific studies conducted by Charles McClure and various study teams for developing a concept that would replace FILS. Government, however, re-crafted the scientific reports of research into administrative or political concepts. OMB and agency personnel developed guidance and GILS records. The legislative system re-crafted these reports into legislation which was itself perturbed by the politics of Republicans and Democrats.

The legislature held congressional hearings to listen to the public. Those providing testimony included representatives from the business community, from science, and from education. Librarians were invited and testified frequently, providing public opinion in

support of the need for access to electronic government information resources for libraries in support of both education and economic interests. Some committees also held hearings to discover what agency personnel were doing with technology or to discover how OMB and the General Services Administration were managing their responsibilities in relation to computers (or automated data processing equipment, as it was called in the mid-1980s).

Perturbed by public opinion and changing technology, the administrative sub-system developed binding decisions. To develop further binding decisions required exploring past binding decisions. For the Paperwork Reduction Act of 1980, congressional staff wrote a legislative history that situated this bill within a constellation of related laws. The Paperwork Reduction Act of 1995 claimed the same legislative history and built on it, including such laws as the Computer Security Act of 1987, the Chief Financial Officers Act of 1990, the Computer Matching and Privacy Protection Act, and the Freedom of Information Act, for example.

OMB guidance (like Circular No. A-130 and Bulletin 95-01) referenced public laws as part of their authority for providing additional guidance. These laws and agency guidance functioned as structural communications and decision-making schemata. They were referenced again and again in relation to questions raised as programs and services were developed.

Agency personnel also participated in the development of standards like GOSIP, the GILS Application Profile, and Z39.50. These standards constrained the solutions available to government as it purchased computer equipment and developed information services like GILS.

The political sub-system crafted political programs. Republicans managed government operations in the early 1980s to reduce the burden (whatever that means) on the public, reducing costs of operations. Democrats managed government operations in the 1990s to provide valuable services (whatever that means) to the public, including GILS. Meaning emerges by means of second order observations; it cannot be attributed once for all to these political messages. In politics the minority is quick to suggest meaning for the programs of the majority that differed from that which the majority intended.

Q3. How did multiple causes motivate a problematic effect?

Chapter 2 includes descriptions of several assessments of GILS. Some of these are positive assessments; others are negative. In addition, when agency personnel were creating GILS records and setting up the Z39.50 servers to deliver GILS search and retrieval services, many questioned the relative value of such resource-intensive work, especially when Internet search engines were making a keyword search of vast web sites feasible. Many agencies have not updated their records, leaving in place collections of 1995 vintage GILS records as relics of the early Internet. Each of these statements suggests that GILS is the problematic effect for what was once judged to be the best solution (Moen and McClure, 1994). How did this occur?

Following Luhmann's recommendations, I have employed second order observation strategies here by asking *who* observes GILS as a problematic effect. Some government agencies assessed their efforts as successful. They successfully created GILS records to describe their information programs. Those records were in compliance with the guidance of OMB and NARA. Those records were available via the Internet either

through their own GILS server or that of another agency. For many agency personnel, GILS as a task was completed successfully by early 1996. Agencies also developed other strategies by which the public could search for and locate their online information.

Library science conducted research on GILS (Moen and McClure, 1997) and found it wanting as a search and retrieval application. For library science, GILS was a problematic effect.

Like all information services, GILS emerged as a product of a collection of communications. As a government product, the legislation that mandated GILS was crafted by the administrative sub-system in relation to the political tug of war between the Democrats and the Republicans over the practices associated with such processes as designing regulatory paperwork forms, with managing operations in ways that left the Republican administration open to Democratic charges of operating government in secrecy, and with the Democratic charges of government mismanagement. It emerged to fill the space once held by the Federal Information Locator System, and by its place in the Paperwork Reduction Act, it is tied to the regulatory management processes of government. It emerged in relation to the communications of the public sub-system, which developed public opinion in support of access to government information by means of computer networks.

Although GILS was developed by several persons working together as an interagency task force and, in conformance with standards and official guidelines, the collections of records representing each agency vary considerably. While some agencies produced thousands of records, each describing an individual publication, some agencies

produced only records describing major information services. These include such services as an agency library or its Freedom of Information procedures. What particular information products were selected for inclusion in the GILS project was determined at the agency level. Agency missions and practices in relation to disseminating information to the public vary considerably. Therefore, the GILS project can be described as somewhat coordinated while at the same time highly disintegrated. Agency independence emerges from legislative mandate, mission, constitutional balance of powers arguments, and attention to various publics. It is sorted out by each agency.

Finally, GILS can be considered a problematic effect because of time. The Internet changed while GILS was being designed and implemented. As with GOSIP and TCP/IP, GILS was considered at one time to be the best solution, but agency personnel found it to be complex and burdensome. Netscape released its browser after GILS decisions were made, and then agency personnel implemented HTML-based services. The binding decisions associated with the early development of GILS (use Z39.50 and a customized record structure to describe a particular set of resources) set GILS to the side of later major developments associated with the Internet.

Q4. How does the political system create an information locator service for use by the public, composed of unknown and unknowable individual users?

This question provides the opportunity to consider how the eventual users of GILS were observed during the development of GILS by the system of politics. The political system knows its users as "the public" or as a perturbation from its environment, the out-of-government side of the in-government/out-of-government distinction. How did

administrators identify these mythic end users? How did they discover the information needs of these users? How did they design services for them?

For the political sub-system, the public is a potential voting public. The political sub-system developed in the relation between the Democrats and the Republicans a politically stylized version of the problem of making government information available to the public. In the 1980s Democrats charged Republicans with managing government to enlarge secrecy and ignore the responsibility to disseminate information that could inform and protect the public. Republicans charged Democrats with profligate spending proposals and regulatory program proposals that would overburden business. Although these charges are related to highly complex issues, the political process distilled them into simple binary decisions to which voters responded.

Some issues, however, such as making government information available via the Internet and reducing the burden of the government on the public, had become *bipartisan* issues in the 1990s. Once legislators reached bipartisan agreement on the proposed legislation, then the only political conflict had to do with *when* the bill should be passed. Should it be passed during the 103rd Congress (dominated by a Democratic majority) or early in the 104th Congress as part of the Republican Contract with America? Republicans managed to defer this popular bill until the 104th Congress convened. The delay did not frustrate progress on GILS, however, since it was being developed within the administrative sub-system as an interagency and an international standards initiative in conformance with a federal information processing standard (a binding decision) independent of a legislative mandate. At the same time, the law provided the

administrative sub-system the legislative mandate for sustaining GILS beyond the limits of a short-term task.

Agency personnel who made the decisions about which information services would be described using GILS operated in relation to the political and the public sub-systems. Most government agencies can readily describe their own public users. For the National Technical Information Service, these are businesses; for the Department of Education, educators; and for the Department of Agriculture; farmers and county extension agents, for example. Agency personnel made GILS decisions with the information products they had developed and their view of a public developed by their past experience.

Moen & McClure described a process of writing standards with the user in mind. (1994, p. 89) They used the GILS Application Profile and the work of the Z39.50 Implementors Group (ZIG) which worked out options available for GILS within the Z39.50 standard. Moen and McClure described these technical experts as users of the standard.

> On what basis are they contributing? One might suggest that in their own implementations they are experiencing new problems that need to be resolved through the standards development process. At another level, as system designers and managers, they also stand in for the end users of their systems.

Agency personnel who contributed to the development of GILS in general and to the development of particular GILS records and GILS interfaces stood in for their own end users.

How else could they have designed for the end user? As communicators within the administrative sub-system, they did not have access to the thoughts and needs of particular

users. This is also true for librarians. When a librarian conducts a reference interview, she is a psychic system interacting with another psychic system in relation to the client's information need (a student's class assignment, for example) and the information resources of the library collection. Her construct of the available information is not the student's; however, if the reference interview is successful, they each develop meaning in relation to the problem of the assignment and the library resources. If they appear to reach some agreement, it is because as they communicate, the ongoing understanding of one seems to complement and agree with the other's communications. Double contingency still operates here, but each person has learned rules of operation for managing the relation between them.

Agency personnel have experience working with their agency clients. They observe public opinion and their agency responsibilities developed in relation to their agency's legislative mandate. If the relation with their public is successful, they develop meaning along with their public in relation to the information products provided by the agency that seem to complement each other. That experience remains contingent, but as with the librarian and her client, they both learn rules of operation for managing the relation between them. Agency personnel crafted GILS records with these rules of operation at hand.

Challenges Associated with Using Luhmann's Theory

One purpose of this dissertation was to investigate the utility of Luhmann's theory and methods. Working with Niklas Luhmann's theory presented me with challenges that were both obvious and obscure. Luhmann's methodology involves observing

communications, challenging the given, and employing strategies of second-order observation. Unlike other research procedures, the process of observing communications is time-consuming and does not necessarily cumulate, and progress toward the goal is not obvious early on. A high tolerance for ambiguity is an important characteristic if a researcher hopes to avoid becoming disenchanted with Luhmann's strategies. This challenge was obvious to me early in the dissertation process. It persisted throughout the process to varying degrees of severity.

My greatest difficulty with Luhmann's work, however, involved shifting my thinking from operating within the constraints of presumed universal and transcendental concepts to operations that drew distinctions. Developing meaning that fit Luhmann's theoretical structures involved shifting from seeking evidence of universal, natural laws that govern all things to distinguishing this from that. It involved shifting from discovering a coordinated single story to explain the whole to discovering multiple descriptions that stand distinct from each other. I found that using Luhmann's theory required leaving multiple descriptions unsynthesized.

Throughout the dissertation process, I found that my natural tendency was to impose a non-Luhmannian world view on the data. Not only that, but this was often obscured and latent in my work. For example, I found myself reading for facts, for certainty about the details of events, for determinate information on which to base my reporting. When did this happen? How many are there altogether? Who did this and what is their authority? I have had to backtrack, to reconsider a series of communications not as

a reporting of facts, but as a constellation of communications in relation to each other and in relation to a social system.

To successfully conduct Luhmannian research I had to begin with Luhmann's first assumption: that there are social systems and that they are composed of communications. With that as my initial assumption, I was then able to draw distinctions and make second order observations, that is, observing who said what. Immediately, multiple possibilities for developing meaning emerged. As a second order observer, I could develop more than one meaning for a series of email messages. They might function as a political communication for the politician, an economic communication for the corporate software author, and a scientific communication for the scientist. Meaning is determined by observing the one who observes the communication.

The date of an event depends not upon the calendar date of its occurrence; rather, it depends on when it was noticed by a system. My own description of the processes associated with the development of GILS, then, could not be built on strictly historical timetables. Nor could it be delivered as though one explanation could tell the whole story. Rather, it required more than one telling to describe the development of GILS.

If there were challenges, they stood in contrast to the benefits I experienced using Luhmann's research strategies. As described in chapter 4, I used a modified version of Luhmann's strategy for organizing and analyzing my data. Luhmann compiled manually-written notes on what he read, tagging each page of notes with a unique number for filing. He further marked his notes with cross-references to other notes and stored all them in boxes, Zettelkasten (Luhmann, 1992b). When he developed a question for investigation,

he selected relevant notes and gathered them along with books and journal articles on tables organized in a circle around him. He sorted through them until distinctions produced meaning (Krajewski, 1998). An advantage he had working with paper notes was that where links were more dense, the piles of materials grew in depth on the tables that surrounded him, indicating rich reservoirs of communications that have motivated the intense attention of the system.

Following Krajewski (1997, 1998, and 2000), I used computer software for organizing and preserving the communications I used as data for this dissertation. My software EndNote 4.0, allowed me to collect complete citations for each communication analyzed, to add keywords and my own comments about those communications. It also allowed me to conduct automated searches of my data.

I read through the messages posted to the GILS Forum twice, first, to get a sense of the project and add initial notes and keywords; and second, to add more cross-references and keywords that surfaced as significant in later messages. I copied each email message into the notes field of my EndNote bibliographic software and wrote a brief description of the message in the abstract field. For messages that I found interesting, I also added my own comments (in bold to distinguish them from the original message). As I read, whenever a message cited another publication I tracked that publication down and added it to my collection of data. I added EndNote file numbers to identify particular communications wherever Krajewski's recommendation of author:date did not well enough distinguish one communication from others.

Besides tracking down the communications referenced in the GILS Forum, I conducted several sweeps of standard reference bibliographic databases like *Library Literature, WorldCat, Electronic Collections Online (ECO), Public Affairs International (PAIS), GPO Access, and Lexis-Nexis* in search of publications about GILS and to fill in what seemed to me to be gaps in my notes. I also used Internet search engines like Google for UncleSam and government agency-specific search engines to uncover additional information about GILS. I created a new EndNote record file for each new resource, noting its Internet URL and (if I saved it) its location on my computer.

Luhmann admitted to reading not for a thorough understanding of a work, but rather for a sense of the author's arguments (Luhmann, 1997; Krajewski, 1998). Initially, I tried hard to understand what was going on in the communications, to understand how GILS was supposed to work. For a time, I considered installing Z39.50 freeware and setting up my own GILS server to mimic the work agency personnel were accomplishing. Before getting very far into this project, however, I began to suspect that these endeavors would not contribute to understanding the network of communications that constrained and facilitated the development of GILS. My experience with a particular piece of software, a particular computer, and my own particular group of support personnel would be very different from that available to the developers of GILS. As the project progressed, I found I more closely followed Luhmann's recommendations for reading and note taking.

I collected notes in a separate record about the kinds of concepts that surfaced again and again along with the record numbers where they occurred. I recorded concepts, definitions found in the communications, and my own thoughts about those concepts.

These files included the concepts discussed in chapter 5--simplicity, complexity, and so forth. They also included concepts that later I was able to see were not significant to the list; after a brief flurry of activity, they disappeared from the conversation.

I discovered that the legislative materials--congressional debates, some hearings, reports, and the text of the law--were so dense with references that I needed to print them out and make manual notes to get a sense of the network of communications. I found it far easier to discover the network of references by spreading my notes about these legislative communications out around me than by attempting to read them on the computer screen.

Once patterns of communications and system-specific distinctions began to surface, I brought catachrestic challenges against them, using concepts from other social systems to confirm my initial observations. For example, although budgets affected the task-oriented nature of the GILS project in the administrative sub-system in 1995 and 1996, profit considerations (of economics) did not.

Other notable benefits of using EndNote included the ability to conduct field-specific and whole-database searches, to copy and paste text into my chapters, and to frequently back up the whole project to a zip disk. I also found the portability of conducting this research on a laptop computer to contribute to my productivity. I was able to take my research with me to lunch, to conferences, and on road trips.

Significance of this Study for Library Science

How does the dissertation fit within the context of information science and librarianship? In their 1997 scientific evaluation of GILS, information scientists Moen and McClure recommended further research and evaluation of the Government Information

Locator Service (p. 119-122). To be sure, they did not recommend a Luhmannian study of the development of GILS; however, their varied list of possible research projects suggests that GILS provides a rich topic for scholarly attention.

As an historical event, GILS was an early implementation of the Z39.50 standard on the Internet. It emerged as the Internet was being transformed from an esoteric network for scientific research to an "information superhighway" used by anyone to communicate, solve problems, and conduct business. GILS was an early Internet service. It described government information resources to make them available to the public via the Internet. Although its records describe electronic resources, it also describes the services and mission objectives of the various agencies and includes detailed information about how to contact agencies about their programs. GILS was a part of a broader Clinton Administration era initiative to transform government agencies from print-based information product operations to electronic information dissemination systems. Not only was GILS an early Internet development, it was also developed by participants using the Internet, and those communications (the data for my research) have been preserved on the Internet.

GILS also suggests how much things can go wrong when service provider objectives are at cross purposes with user expectations. How this played out with GILS caught me (a librarian) by surprise. Looking first at the legislative literature (hearings, reports, and Congressional debates) about the Federal Information Locator System, I discovered that the assumption of government was that the information it had to manage was all related to its own regulatory processes. Legislation produced regulations.

Regulations produced regulatory forms. Regulatory forms produced information reported by the public. That information produced agency files. Reports were produced from those agency files. Those reports (publications) informed the public. According to the conclusions of the 1977 Federal Paperwork Commission, if government could track the data elements of those regulatory forms, it could successfully uncover any duplicate elements and reduce to an absolute minimum the burden of paperwork on the public. With one database of data elements, agencies could discover which other agencies had already collected the information required to accomplish its regulatory tasks. Into the wide funnel of the search facility of this database would flow every agency's information requests, and out of the narrow spout at the other end of the funnel would flow an orderly, controlled, efficient, and economical supply of information readily available for accomplishing an agency's regulatory mission. This was the in-government vision for FILS.

An out-of-government explanation for the flow of government information during the 1980s is revealed in Hernon (1989). He described the policies of the Reagan era which affected government publishing as causing a dramatic reduction in the flow of government publications to the public. The Administration's information policies were illogical, inconsistent, fragmented, and confusing. They increased physical barriers to information, relied on discretionary authority of the Office of Management and Budget to manage, and considered government information a cost factor rather than a benefit to the public (p. 405). Hernon's observations are well known in library science. They reflect what librarians would have observed in their own depository collections: many valued publications ceased publication during the 1980s.

This reveals something of how librarians observe government publications. They are valued publications provided to libraries free of charge. Many are processed and shelved as standard reference resources or frequently-used journals in many libraries. They happen to be published by the government, and when the flow is curtailed, librarians complain. Recovering from the loss of a government publication involves seeking out and investing limited funds in vendor-supplied replacements.

The difference between the vision of government information held by the Commission on Federal Paperwork and Hernon is striking. For the Commission, government information emerges from the regulatory process. If information is managed well, then government will be managed well. For Hernon and for librarians, government information emerges as a product of a publisher who happens to be the government. If government is managed well, then it will provide a rich and dependable supply of useful publications.

Moreover, in the opinion of librarians, government will provide a useful index to those publications. This introduced another surprise for me. A collection of carefully constructed records describing government information products[7] (described by their authoring agencies, no less) along with powerful search and retrieval software (Z39.50) does not guarantee a useful information retrieval service. It wasn't the purpose of this dissertation to discover why GILS doesn't work as a library-like information retrieval service, and that it does not still puzzles me. Moen and McClure (1997) suggest

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[7] GILS records are crafted in ways very similar to MARC records used so successfully in library catalogs. Indeed, the GILS Application Profile required that records retrieved be available in three formats, including MARC.

possibilities for why GILS was not successful, including agency irresponsibility and mismanagement (p. 5), ignorance of the principles related to describing information products (p. 5-6), confusion and resentment (p. 15), the uneven level of description (p. 87), and the lack of enforcement (p. 38) to name a few. Many of these criticisms, however, do not explain why the GILS-compliant records which exist and which are searchable to the level of particular record fields are not found to be useful even to librarians (p. 106-108).

Conclusion

This dissertation presents a representation of the development of GILS by the political system. It presents some of the political debates between the majority and the minority parties, communications constructing administrative programs, and examples of public opinion that developed in relation to each other. As a product of this political system, GILS emerged in relation to its binding decisions which themselves emerged in relation to the stylized communications of the three sub-systems of politics, disturbed by environmental perturbations like technology, the observing of rapid change, and the communications of such social systems as economics, education, judicial law, and science.

Having observed the development of GILS and its evaluations within the constraints of Luhmann's theory, I come to the conclusion that GILS is very different things for different observers. For government, it was a program or task constrained by binding decisions. For librarians, it was potentially a powerful finding aid but it proved to be of little use for the kinds of searches they conducted. For economics, it was an opportunity to participate in an early experiment in managing knowledge using the

Internet and computer software. It was a research and development project, a learning laboratory where technical experts in business (in close consultation and collaboration with technical experts in government) developed products and services for an emerging and potentially profitable market. Those government technical experts were potential customers interested in the computer software products and services the corporate technical experts developed.

GILS, then, is not simply a single system or service. What GILS is depends on who is observing it. The opportunity afforded by observing it by means of these multiple systems is that new possibilities for meaning emerge, and with new meaning, a system can construct tentative rules for interaction with other systems.

Librarianship, if it wishes to affect government decisions about information products and services, can observe government operations by means of the functions that produce those services. It observes politicians and party platforms and it observes the wide variety of binding decisions expressed by administration. It develops statements that are observed by politics and administration as public opinion that perturbs those other systems.

Public opinion is in relation to these other political sub-systems, not in relation to the work of librarianship, however. To be more than environmental noise–to successfully perturb politics and administration–its communications of public opinion must conform to the functions of the political system.

The work of librarianship in developing public opinion about government information products and services involves a dramatic reduction of environmental

complexity. Librarians provide information services to clients who are themselves interacting in many different social systems, including education, economics, and judicial law. In relation to the in-government/out-of-government distinction, these are out-of-government systems. When librarians develop public opinion, they do not present the complexity of their operations or their observations of other systems' operations. They communicate in relation to politics and administration. To be effective in developing public opinion, they will refer to political promises of politicians and the binding decisions of the administration. To affect future in-government decisions, they will craft their suggestions in relation to the interests of politicians who want to be re-elected and to parties which want to be a majority in government. They will craft their suggestions for policy guidance and laws which can be expected to be noticeable and useful; that is, to be successful.

They will not expect government to accomplish the work of librarianship or economics or the family system. Although government can be perturbed by economics, it cannot itself be profitable because it expresses power, not profit, and this very thing is what distinguishes government from economics. Although government can be perturbed by the work of librarianship to organize and provide access to information (for clients operating in various social systems), government cannot itself organize information in librarian-like ways because it expresses power; this very thing distinguishes government from librarianship.

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APPENDIX A
SOCIAL SYSTEMS GLOSSARY

Included here is a glossary of terms commonly found in Luhmann's work. It is offered with the warning that definitions suggest a static and isolated understanding of each term; however, there are at least three reasons for being suspicious of definitions. First, Luhmann's work insists on the reproduction of meaning within social systems by means of the concept of difference. Meaning emerges with the relation of information to information; it is found in the difference.

Second, meaning emerges in a system, whether social or psychic; it is not a Given in the universe. Social systems construct meaning by means of their own information processing. A thing may have entirely different meaning to an economic system than it does to a scientific or political system. For example, a community development project designed with sensitivity for nearby wetlands garners praise from business interests; to the Environmental Protection Agency and the Army Corps of Engineers, it is a menace, threatening the destruction of the environment (Adler, 1999).

Third, meaning shifts in relation to other meaning. It emerges in the midst of a constellation of meanings for systems. As systems evolve, so too does that constellation of meanings. A simple definition cannot capture change in meaning across time and changes in relation to the meanings of other terms. Changing one changes the others; bringing terms into relation with other terms changes meaning. As Luhmann himself argues, "definitions serve only to delimit, not adequately to describe (let alone explain) the object under investigation" (1993, p.7).

Keeping these caveats in mind will contribute to overcoming the shortcomings of this glossary. Where the definition relies on a particular passage from Luhmann's work, that work is cited. I have also referenced a paper by Peter Fuchs which functions both as a kind of glossary of social systems theoretical terms and as a sophisticated, yet simple, introduction to Luhmann's theoretical work (2000). Any misunderstandings represented here of Luhmann's theoretical terms, however, are my own.

The Glossary

Action–Actions are not Given or provided as objective entities to an observing subject. They are constituted and identified by communications within a system, dependent for that identification on the structures and the history of that system (Luhmann, 1990a, p. 57). In other words, actions are whatever it is to which a system itself (not its environment) or an observing system selects and attributes the meaning "Action" (1990a, p. 6). For social systems actions are always in relation to other actions, and meaning is borne by the system, not by the individualized psychic systems who contribute to the action (1990a, p. 59).

Autopoiesis–developed by Maturana and Varela (biologists) this is the process in which a system reproduces within itself the elements (the elementary units) that make up the system itself. It is by these elements that the system distinguishes itself from its environment. The system may be in the form of life, consciousness, or (in the case of social systems) communication. For social systems, autopoiesis is continuing communication. If the system ceases to communicate, it ceases to exist. Like

biological systems which cease to exist, the system dies. This possibility drives the self-organization of the system (Luhmann, 1990a, pp. 1, 3, 14).

Boundary of a social system–Boundaries are the difference between the system and its environment. Boundaries are constituted by meaning in the system. They are composed of meaning, although they may fall along with concrete, physical boundaries as with a laboratory or a restaurant (Luhmann, 1990a, p. 51). By means of a meaning boundary the system regulates the difference between itself and its environment (1995, p. 17). The boundary is a complexity gradient, extending from the relative simplicity of the system (constructed by its own selections) to the much greater complexity of the system's environment (1990a, p. 51). The system's environment represents for the system immeasurable complexity, but the system itself expresses itself by its functions at a level of complexity that promotes its autopoiesis.

Codes–A social system uses a code, a language-based vocabulary of words with meanings and rules of use, constructed by the system itself. Systemic codes develop a binary scheme of positive and negative values (this/not this) which are used by the system for making selections (decisions), for observing itself, and for observing its environment. Science observes the world by means of the binary code, true/false. This concept of coding is not the same as the concept developed in linguistics because this code is system specific. Science is concerned with true/false but ignores (for its own scientific understanding of phenomena) the binary of conservative/progressive. The political system, however, can make great sense of

the world in this way. Examples of codes include buy/sell for the economy, love/not love for the family, and legal/illegal for law (Luhmann, 1982, p.168-173). Using the code conservative/progressive, the political system orders "particular interests either with the forces of progress or with the features of the existing social order most worthy of being preserved" (p. 176).

Communication–Communication is not a simple transfer of information as in a sender-receiver or transmission model. It is a shared actualization of meaning that informs. Those communicating share a common underlying meaning structure that allows the reciprocal regulation of surprises (Information is any difference that makes a difference (surprise) according to Bateson). It is historical in nature, arising from experience and communicative processes. Communication is not dependent on language, but language increases the functional ability for selectivity of a system. Systems communicate by an autopoietic operation of three selections: information, utterance (or sharing–*Mitteilung*), and understanding. From the horizon of all possible information, the system selects information. From all possible utterances, the system makes a selection of utterances. From the selection of all possible differences between the first selection of information and the second selection of utterances, the system makes a selection of meaning. All of these together form an emergent unity that serves as the basis for further communication. Understanding emerges (Fuchs, 2000, p. 62. See also Luhmann, 1990a; 1992).

Complexity–A state of affairs is complex when it arises out of so many elements that the system is forced to make selections (decisions) about the relation among its

elements. It selects this relation and ignores another. Complexity presupposes a reduction procedure of decision-making practiced by a system which selectively allows some relations and excludes others as mere possibilities (potential, but not selected, possibilities). These decision-making procedures of the system govern how the elements of the system connect to each other. Complexity, then, is the necessity of a system for making selections in order to manage complexity, to reduce complexity. Thus, complexity is also a measure for indeterminacy and lack of information (Luhmann, 1995, p. 27). The system remains ignorant of that which it does not select. The system may reintroduce this ignorance into itself as a problem which it seeks to solve, as a risk, an uncertainty, anxiety, or even as an excuse (p. 28).

Contingency–This concept allows that "it could be another way" or "other selections are possible." Something is neither necessary nor impossible. By selections of relations from a complex state of affairs, the system orders itself into relations that, by other selections, might have been different. In a psychic or social system, the contingency of one observer is not available to the others, and vice versa, double contingency. A social system must overcome double contingency in order to successfully function. An individual psychic system (ego) must overcome double contingency in order to successfully communicate with another psychic system (alter). The complex self-referential processes of ego's psychic system are unknowable to alter, even as alter's are unknowable to ego. What ego understands of herself, however, she assumes of alter. Through this simple process, ego

immediately reduces the complexity of the situation. Ego assumes that alter proceeds in the same way, and they together build a system of assumed understanding. In this way ego and alter (whose communications now compose a social system) proceed (if they try long enough) toward a constructed and shared understanding. The two psychic systems by means of their communications develop an orientation toward the situation, expectations, and an autopoietic social system (Luhmann, 1990a, p. 44). These systems develop procedural rules, regulations, and codes for understanding and changing their relationship with individual psychic systems and with society (Holmes and Larmore, Translators' introduction, in Luhmann, 1982, p. xix).

Cybernetics–Cybernetics builds on the concepts of variety, circularity, process, and observation. It uses circularity: feedback loops, recursion, self-reference, and autonomy (Little, 1997). Heinz von Foerster developed the concept of second-order cybernetics, the science of observing systems. Cybernetic, self-referential systems construct their reality through a recursive calculation of calculations. First-order observers are actors observing themselves. Second-order observers, according to Luhmann observe the first-order observer in his or her situation. Science has assumed this produced objective (better) knowledge. Luhmann identified it as "different" rather than better knowledge (Luhmann, 1989, p. 25). Interestingly enough, Little explains that von Foerster "saw the goal of second-order cybernetics as to explain the observer to himself" (Little, 1997, p. 244).

Differentiation, functional–This refers to the formation of systems within systems. Systems

distinguish themselves from their environment and from each other. A system expresses functional differentiation if its identity is developed through the functioning of that system. The family functions by expressing love, and the political system by expressing collectively binding decisions (power). What the family is successfully able to accomplish cannot be accomplished by systems that are not family; and whatever expresses love is family. Thus the family functionally distinguishes itself from that which is not family by means of the binary love/not love.

Elements–Elements are the non-decomposable units of the system and are produced by the system itself. The system continually reproduces its elements (which themselves have no duration) by means of the elements that compose it (autopoiesis). Elements are in relation to other elements and are defined as elements by the system that reproduces them. For example, in an action system, elements are actions. (Luhmann, 1995, p. 11, 22; 1990a, p. 4).

Event–Events are system elements fixed by the system as points in time. They occur once and are identified in time. They cannot be repeated. As such, they are the elementary units of processes (1995, p. 67).

Form–The concept of form has been easy to confuse because of the multiple meanings readers bring to the word. When Luhmann speaks of the form, he references the work of George Spencer Brown who began with the instruction to "draw a distinction." The form is simply that distinction with concepts organized into two parts, one on either side of that distinction (A | B). Spencer Brown used two

typographical symbols to represent the distinction, ⌉ and ◯. With the ⌉, he included not only the distinction, but also the indication, the horizontal mark at the top of the vertical mark which indicates the side of the form that draws the attention of the observer. For the form A ⌉ B, A is the indication. The ◯ distinguishes that which is internal to the circle from that which is external. Luhmann resisted using typographical symbols, preferring descriptive words to any symbol which could mislead the reader into assuming the boundary of the form was somehow complete or concrete.[1] Only one side of the form can be indicated at a time. For the form conservative/liberal, when observing conservative, one directs attention to that which is conservative. At the same time the observer allows that which is liberal to inform that which is conservative as a kind of negative correlation. Observing a form results in an asymmetrical preference for one side or the other. To cross over to the other side, or to observe the form as a unity requires considerable intellectual effort, because the observer brings to the observation a preference (Luhmann, 1986, section 13).

Function–A function is that which helps a complex system orient itself toward and distinguish itself from its environment; that which helps a system to describe itself, to simplify itself and also to make itself more complex. Functions are a "mode of ordering that acquires pre-eminent importance" in systems becoming more complex (Luhmann, 1995, p. 299). Systems self-observe, feed those observations

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1 For this work, I have used the slash (/) when referring to a unity of both sides of a form, for example, government/opposition.

back into the system's communication, and "occasionally fix the result in successful structural achievements," to "orient structural selection under the condition of greater complexity" (p. 303). Systemic structures direct themselves toward functions (p. 339). Luhmann's functions must be distinguished from that introduced by Smith and Durkheim, Malinowski, Radcliffe-Brown, Parsons, and Merton. It is not a causal-scientific method, nor are its systems based on substantial objects belonging to classes. (Bendarz, 1984, p. 346). Not only does Luhmann distinguish his functionalism from historical functionalism, but he also sets it apart form the unified scientific method. His functionalism does not set out to seek unchanging invariant relations between causes (performances) and effects (functions). Instead, for Luhmann function is "a regulative meaning-schema that organizes a domain of comparison of equivalent performances" (Luhmann, in Bednarz, p. 357). As such, functionalism discovers that different possible solutions are available for solving particular problems. Functional analysis, then, involves seeking "different possible system performances which can serve as solutions to the problems" (Bednarz, p. 349).

Functional analysis–This is the principle of scientific system observation (Luhmann, 1995, p. 300). Functional analysis is the process of testing methodologies, of testing and comparing multiple solutions to a problem in search of the solution that is least dysfunctional (Luhmann, 1990a, p. 15).

Information–Information is an event that selects system states, that actualizes the use of the system-specific structures (1995, p. 67).

Learning–Learning is "an ability to adaptively or innovatively alter the structures regulating information processing. Such learning ability appears to rest in the relationship of abstract to concrete premises of experience processing and to increase the increasing abstractness of the system structure, for both psychic and social systems" (Luhmann, 1990a, p. 44).

Meaning–Meaning is not a subject property of actions, but "a determinate strategy amongst alternative possibilities. . . the constituting and integrative *relations* among" system components (Bednarz, 1989, p. x). "[M]eanings constitute themselves self-referentially, i.e., they refer exclusively to other meanings," organizing horizons of further communicative alternatives (Bednarz, 1989, p. x). Contained in meaning is that which is actualized in relation to all that is possible. Meaning consists of a form composed of that which is actualized (the positive) and its negation. That which is negated is not destroyed; rather, it is secure and available to the meaning-constituting system by a further negation of the negation. The function of meaning is to preserve the system's reducible complexity (1990a, p. 67). Meaning has a fact dimension, a temporal dimension, and a social dimension. The fact dimension is related not to a "thing schema," a Givenness, but to the difference between the thing and that which it is not. The temporal dimension relates to the event-like character of meaning; it is related to before and after and identified by when, not who, what, where, or how. Its social dimension indicates that meaning is constituted in relation with others (Luhmann, 1995, p. 59ff; 1990a, 20ff).

Modern Society–This phrase refers to "a highly abstract communicative network that does little more than define extremely vague and lax conditions for social compatibility" (Holmes and Larmore, 1982, p. xviii). Modern society for Luhmann is differentiated into multiple functional sub-systems.

Observation–This is the operation in which an observer makes a distinction in order to indicate one or the other side of that distinction. It is the basic operation of understanding (1995, p. 73-74).

Openness and closure–A Luhmannian system is both open and closed. The system mediates its own openness and closure. It is able to select information from its environment (open), but it processes that information by means of its own constraints (closed) (Luhmann, 1990a, p. 13).

Paradox–A paradox "refers to a logical collapse of a multilevel hierarchy, not to a simple contradiction" (note 14, p. 18, 1990a). A paradox occurs when the conditions of the possibility of an operation are at the same time the conditions of the impossibility of this operation. The legal system has no legal right to distinguish legal/illegal, for example. A self-referential system, through the operation of negating, creates the paradoxes that block its own operations. Systems must foresee possibilities for eliminating the paradox. The unfolding of a paradox involves the asymmetrical selection of one indication or another (the liar's paradox, "This sentence is a lie," requires that one distinguish true/false and indicate one side or the other in order to think beyond the sentence itself. See also the Apostle Paul's unfolding of the Cretan's judgment about Cretans [Titus 1:12-

13]). The system does not necessarily have to recognize that the unfolding of the paradox involves the operations of the system itself. Luhmann used paradoxes to initiate and terminate theory-driven research (1990a, p. 8; 1989, p 39; 1994, p. 127).

Reentry–This refers to the observing system presenting to itself the difference of system and environment within the system by means of second-order observing (Luhmann, 1990a, p. 12).

Resonance–This signifies that systems can react to environmental events only in accordance with their own structures (Luhmann, 1989).

Self-reference–Every operation that refers to something beyond itself and through this back to itself is self-referential. A tautology is a kind of pure self-reference which does not detour through what is external and back to itself. Real operations or systems depend on an 'unfolding' or de-tautologizing of the tautology. Only then can they grasp that they are possible in a real environment (Luhmann, 1990a).

Social systems–A social system comes into being when communications connect with communications in a way organized so that those communications can continue (autopoiesis). These continuing communications distinguish the system from its environment by a selection process, by selecting only those communications appropriate to the system. If social systems are composed of communications, then they are not composed of persons (Luhmann, 1989).

Society–Society is that social system which includes all meaningful communication and is always formed when communication takes place in connection with earlier

communication or in reference to subsequent communication (autopoietically). Luhmann describes it this way: "Society is the all-encompassing social system that orders all possible communication among human beings" (1990b, p. 30).

System–The system is a unity composed of "the multiplicity of its operations" (Luhmann, 1988, p. 161). It is a network of operations operating by means of its own structural constraints. For example, the legal system is the network of legal decisions. These decisions make distinctions in relation to the form legal/illegal. The constraints have to do with the relation of one decision upon others and with the exclusion of other possibilities for the system.

System/environment distinction–This fundamental distinction is how Luhmann begins his description of society. What is system is not environment; and what is environment is not system. Yet the one is the negative corollary of the other. From the difference between the two emerges understanding. Society is a system that is composed of all meaningful communications. Whatever is not communication is then environment.

Understanding–It is composed of the basic operations of observation and meaning development. It occurs when one makes distinctions between system and environment and projects a closed, self-referentially reproduced meaning within this system/environment distinction (1995, p. 73-74).

World–The world is sum and the unity of all meaningful references (1995, p. 70). Thus, the world is not the physical globe and all that is therein. What one understands of "world" is tied to meaningful communications (1995, p. 70).

APPENDIX B

THE GOVERNMENT INFORMATION LOCATOR SERVICE (GILS) REPORT TO THE INFORMATION INFRASTRUCTURE TASK FORCE, MAY 2, 1994

The document reprinted here is the structurally guiding document used throughout the development of GILS to resolve differences of proposed strategies recommend by the GILS Forum members. It is composed of the following parts:

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The Government Information Locator Service (GILS)

Report to the Information Infrastructure Task Force
May 2, 1994

The Government Information Locator Service (GILS)

Executive Summary

In coordination with the Information Infrastructure Task Force (IITF), the Office of Management and Budget (OMB) is promoting the establishment of an agency-based Government Information Locator Service (GILS) to help the public locate and access information throughout the Federal Government. This report presents a vision of how GILS will be implemented.

Working primarily with OMB and the Locator Subgroup of the Interagency Working Group on Public Access, Eliot Christian of the U.S. Geological Survey prepared this report under the auspices of the IITF Committee on Information Policy. This vision of GILS has also received extensive review by various Federal agencies and other interested parties, including some non-Federal organizations and by the general public through notices in both the Federal Register and the Commerce Business Daily and at a public meeting held in December, 1993.

As part of the Federal role in the National Information Infrastructure, GILS will identify and describe information resources throughout the Federal government, and provide assistance in obtaining the information. It will be decentralized and will supplement other agency and commercial information dissemination mechanisms.

The public will use GILS directly or through intermediaries, such as the Government Printing Office, the National Technical Information Service, the Federal depository libraries, other public libraries, and private sector information services. Direct users will have access to a GILS

Core accessible on the Internet without charge. Intermediate access may include kiosks, "800 numbers," electronic mail, bulletin boards, FAX, and off-line media such as floppy disks, CD-ROM, and printed works.

GILS will use standard network technology and the American National Standards Institute Z39.50 standard for information search and retrieval so that information can be retrieved in a variety of ways. Direct users will eventually have access to many other Federal and non-Federal information resources, linkages to data systems, and electronic delivery of information products.

Development of this report proceeded in tandem with a GILS Profile development project that produced an Implementors Agreement in the voluntary standards process. The National Institute of Standards and Technology is now establishing a Federal Information Processing Standard referencing the GILS Profile Implementors Agreement and making mandatory
its application for Federal agencies establishing locators for government information.

Existing law and policy, as articulated in OMB Circular A-130, the Records Disposal Act, and the Freedom of Information Act, require agencies to create and maintain an inventory of their information systems and information dissemination products. Although compliance with these requirements varies greatly, the incremental cost of making those inventories accessible through GILS is expected to be minimal. Accordingly, participation in establishing and maintaining GILS may be accomplished as a collective effort executed within existing funds and authorities. OMB will publish in 1994 a Bulletin following on Circular A-130 that will specify agency responsibilities in GILS and set implementation schedules. A process for ongoing evaluation will also be established to evaluate the degree to which GILS meets the information needs of the public.

The Government Information Locator Service (GILS)

Introduction

Government information is fundamental to modern societies. Although individual Federal agencies may recognize their responsibility to maintain readily accessible inventories of their records and other information resources, there needs to be a collective vision across the Federal government for information dissemination to the public. The vision of a Government Information Locator Service (GILS) presented here responds to that need and places this Federal vision in the context of broader issues such as promotion of diverse information services.

GILS is emerging at a revolutionary period in the history of information processing where technological breakthroughs have radically expanded the range of feasible strategies. In particular, the realization of peer computer networks allows for a decentralized approach where many different information sources are separately maintained yet are comprehensible as a coherent whole from the unique perspective of a specific user. GILS depends on this network approach to preserve the decentralized character of Federal information dissemination and the wide diversity of sources, both public and private, that serve the public need for information access.

In contrast to a centralized design, a decentralized approach assumes that many different implementations will be separately developed yet will be fully interoperable when implemented. Achieving interoperability is only possible if a stable base of reference is documented and made widely known. In GILS, that reference base is an agreement among active implementors together with Federal representatives. Where fundamental design choices have been made in developing the implementors agreement,
those choices have emphasized the use of stable but extensible standards.

The success of GILS does not depend on massive Federal investment or sweeping new directives. Rather, it adopts voluntary information

standards in order to build on the efforts of the responsible, talented, and creative people throughout Government and in society already working on information access issues. GILS will use this solid base of widely accepted standards to help agencies and information services focus their initiatives and thereby make the vast range of Government information more accessible to the public.

Policy Context

The Administration's strategic technology policy document entitled "Technology for America's Economic Growth, A New Direction to Build Economic Strength" states:

> Every year, the Federal Government spends billions of dollars collecting and processing information (e.g., economic data, environmental data, and technical information). Unfortunately, while much of this information is very valuable, many potential users either do not know that it exists or do not know how to access it. We are committed to using new computer and networking technology to make this information more accessible to the taxpayers who paid for it. In addition, it will require consistent Federal information policies designed to ensure that Federal information is made available at a fair price to as many users as possible while encouraging growth of the information industry. [1]

On June 25, 1993, the Office of Management and Budget (OMB) revised Circular A-130, "Management of Federal Information Resources," to strengthen policies for managing government information (58 F.R. 36068, July 2, 1993). Circular A-130 encourages agencies to use new technologies to make government information available to the public in a timely and equitable manner via a diverse array of sources, both public and private. It states that availability of government information in diverse media, including electronic formats, permits the public greater flexibility in using the information, and that modern information

technology presents opportunities to improve the management of government programs to provide better service to the public. It also notes that the development of public electronic information networks, such as the Internet, provides an additional way for agencies to increase the diversity of information sources available to the public, and that emerging standards such as ANSI (American National Standards Institute) Z39.50 [2] will be used increasingly to facilitate dissemination of government information in a networked environment.

OMB Circular A-130 states that agencies shall:

- o Disseminate information products on equitable and timely terms;
- o Avoid establishing, or permitting others to establish on their behalf, exclusive, restricted, or other distribution arrangements that interfere with the availability of information dissemination products on a timely and equitable basis;
- o Use voluntary standards and Federal Information Processing Standards where appropriate or required;
- o Use electronic media and formats, including public networks, as appropriate and within budgetary constraints, in order to make government information more easily accessible and useful to the public;
- o Take advantage of all dissemination channels, Federal and nonfederal, including State and local governments, libraries and private sector entities;
- o Provide information describing how the public may gain access to agency information resources;
- o Help the public locate government information maintained by or for the agency;
- o Establish and maintain inventories of all agency information dissemination products;
- o Develop such other aids to locating agency information dissemination products including catalogs and directories...

Because the active management of information by agencies is essential to the operation of government and to democratic principles, laws and policies assert a fundamental requirement that Federal agencies maintain readily accessible inventories of their records and other information holdings. The responsibilities of Federal agencies with regard to the management of electronic records are also growing in importance as their reliance on electronic information systems increases. To help the public locate and gain access to public information within agency inventories, the Administration has committed to promote the establishment of an agency-based Government Information Locator Service (GILS).

Working primarily with OMB and the Locator Subgroup of the Interagency Working Group on Public Access (the "Solomon's Group"), Eliot Christian of the U.S. Geological Survey (USGS) prepared this report to the Information Infrastructure Task Force describing how GILS may be implemented. Development of this report proceeded in tandem with a GILS Profile development project that produced an Implementors Agreement in the voluntary standards process. The GILS Profile project was a Cooperative Agreement between the USGS and Syracuse University, funded
by the Interagency Working Group on Data Management for Global Change,
with active involvement from several ANSI Z39.50 implementors representing non-government sectors. [3] The National Institute of Standards and Technology (NIST) is now establishing a Federal Information Processing Standard (FIPS) referencing the GILS Profile Implementors Agreement and making mandatory its application for Federal agencies establishing locators for government information.

Existing law and policy, as articulated in OMB Circular A-130, the Records Disposal Act (Title 44 of the United States Code), and the Freedom of Information Act (FOIA), already require agencies to create

and maintain an inventory of their information systems and information dissemination products. Although compliance with these requirements varies greatly, the incremental cost of making those inventories accessible through GILS is expected to be minimal. Accordingly, participation in meeting the minimum mandatory requirements for establishing and maintaining GILS may be accomplished as a collective effort within existing funds and authorities.

OMB will publish in 1994 a Bulletin following on Circular A-130 that will specify agency responsibilities in GILS and set implementation schedules. A process for ongoing evaluation will also be established to evaluate the degree to which GILS meets user information needs, including factors such as accessibility, ease of use, suitability of descriptive language, accuracy, consistency, timeliness, and completeness of coverage.

The User Perspective

GILS must be many things to many people. It must be comprehensive, yet user friendly. It must answer specific questions, yet enable scanning a wide range of government information. It must be able to answer questions from the most inexperienced users, yet permit in-depth research as well. It must be of direct service to the public, yet not undermine the diversity of existing information sources. Private-sector information providers must be able to participate in GILS and also make their resources known and accessible.

GILS depends critically on other aspects of the emerging NII. GILS must be implemented with full recognition of individual privacy and intellectual property rights. Agencies will need to ensure that members of the public whom the agency has a responsibility to inform have a reasonable ability to access GILS and the underlying information resources and information dissemination products. Agencies participating in GILS must take care to minimize barriers to use, including equipment and software requirements, cost, and technical complexity.

The public will use GILS either directly or through intermediaries. The distinction is that direct users roam at will, but users of intermediate services take a guided tour. The following are some examples of GILS direct users and intermediaries:

> A direct user researching national health care may explore relevant issues from a variety of perspectives by accessing a wide range of GILS and non-GILS information sources.
>
> An educator interested in keeping up with electronic educational materials may access a few GILS sources once a month as a direct user over a dial-up connection to the Internet.
>
> An information service may query GILS hourly as a direct user and also act as an intermediary by constructing a value-added directory derived from GILS for sale to users who need specific products such as government economic statistics.
>
> A Federal agency may act as an intermediary in adding GILS access into its existing information service to provide public information referrals to sources in other agencies.

A major advantage of the networked and decentralized design of GILS is that it allows direct users to explore many different aspects of government information. Since direct users are less limited in their searching, they have more flexibility to explore the full complement of available information. For direct users, there is minimal structure across the GILS locator records and the records are interleaved with a vast diversity of other kinds of information. On the Internet, direct users have tools for interacting with people, news, and libraries in addition to GILS (Figure 1).

<insert figure 1>

Figure 1. The public will use GILS either directly or through intermediaries.

In contrast, intermediate services are typically oriented toward a particular user community and present a more focused experience for users searching for information. Intermediate services need not require users to have sophisticated research skills or electronic network access. Government and non-government intermediaries can present GILS information in the full range of communications media and with a variety of interpretative services as appropriate for various communities. Such services can be offered via electronic mail, bulletin boards, FAX, and other media such as CD-ROM (Compact Disk-Read Only Memory), printed publications, telephone help desks, and information kiosks in public places as envisioned in the Administration's Service to the Citizen initiative. [4]

Clearly, most of the public need for access to government information will be well served through the diverse array of public and private-sector service providers. Casual users and those lacking network access will be served typically through products and services offered by agency or non-government intermediaries such as Federal depository libraries, other public libraries, and private-sector providers. These intermediaries obtain GILS information either as direct users themselves or from other intermediaries, but the extent of government information that may be provided by any particular intermediate service is not prescribed by GILS.

Having unfettered access means that the direct user takes on much more responsibility to construct a context in which the collected information is actually coherent. Accordingly, GILS has certain expectations of direct users, whether researchers or other intermediaries. Direct users of GILS must have network access, be literate in English to at least the secondary-school level, be capable of using a personal computer, and be aware of any limitations of their own hardware or software environment.

Data and Information

Given the huge amounts and vast range of Federal holdings, one might

want to synthesize information by combining data from multiple sources as, for example, to support large scale environmental monitoring. It is important to understand that GILS operates at the level of information about data holdings. GILS addresses how to find files but does not address how the contents of those files may be accessed or used.

Users must be aware that data combined from multiple sources should be used with caution and subjected to appropriate review. Except in very strictly defined domains where common practices are rigidly enforced and data processing is well coordinated, there does not exist sufficiently detailed documentation about the data to ensure its appropriate use for purposes other than for which it was initially gathered. This situation is not peculiar to Federal holdings--whenever data is collected and maintained, it is only possible to provide for a limited set of secondary uses.

In some communities of interest, such as the participants in the National Spatial Data Infrastructure, there is strong consensus on the high secondary use value of certain basic data. This perceived value justifies large investments in data management and the establishment of multi-lateral coordination structures such as the Federal Geographic Data Committee established under OMB Circular A-16. Data management issues surrounding the international Global Change Research Program and the work of the Committee on Earth and Natural Resources are also generating some convergence of opinion on raising the level of data management investments.

While there are complex issues surrounding data comparability, it is clear that complete and readily accessible information about data holdings will be a key requirement. GILS does provide a basis for broad accessibility to the highest level description of information holdings.

The Provider Perspective

A key concept of GILS is that it uses network technology to support many different views across many separate locators. [5] A locator is defined as an information resource that identifies other information resources,

describes the information available in those resources, and provides assistance in how to obtain the information.

Although directly accessible via electronic networks such as the Internet, all or part of the GILS contents can also be made available by intermediaries through virtually any media. These alternative mechanisms help assure that the information is available through a diversity of sources, both public and private, and cover the full range of communications media from telephone help though printed publications and
up to the most sophisticated electronic network technologies.

GILS organizes a collective set of agency-based locators and associated information services. Being decentralized, responsibilities can be kept close to those who understand and care for the information and who are serving the agency's primary user community. Each agency is responsible for ensuring that its GILS components are continuously accessible to GILS direct users. Certain agencies, such as NARA, the Government Printing Office (GPO), and the National Technical Information Service (NTIS), also have in their primary mission an additional role in helping the public to access information maintained elsewhere in the Government. These agencies will assist in providing GILS services when requested by other agencies.

Services for finding government information take many forms, and the electronic aspects of GILS should be seen within the larger context of government information services (Figure 2). For example, the public is served through information desks in Federal buildings as well as telephone help desks and reference services such as "1-800-USA-MAPS." Many kinds of finding aids are used in such services--printed catalogs and directories are and will continue to be very common. With GILS, it will be much easier for those services to provide information drawing on the full range of Federal information resources rather than just agency-specific resources.

<insert figure 2>
Figure 2. Electronic networks are one aspect of the Government Information Locator Service.

Among the government information finding aids are electronic media, including television announcements about government information available from the Consumer Information Center in Pueblo, Colorado. As interactive television becomes more available to homes, GILS will help to simplify the ways in which those services help the pubic to find Federal information resources. Also within the realm of digital electronic finding aids, there are popular information dissemination technologies such as bulletin boards and CD-ROM's. These personal, print media, and electronic services can be used to publicize GILS contents. These services may also be regarded as information resources, and may be
referenced in GILS locator records themselves.

Some digital electronic finding aids use various kinds of networks and so are able to provide access to many different resources, often with a common user interface. In this area, it becomes possible to provide services in GILS where the user can have immediate access not only to information about an information resource, but to the referenced resource itself.

As stated above, GILS takes advantage of network technologies to allow many different information sources to be separately maintained yet be comprehensible as a coherent whole from the unique perspective of a specific user. This is achieved within computer networks that support peer-to-peer relationships and thereby allow for applications to operate using a client-server architecture. All of the server applications that also use the ANSI Z39.50 information search and retrieval protocol can be accessed by GILS direct users.

Because GILS uses interoperable standards for information search and retrieval, information sources referenced in GILS can be placed into virtually any context. Other major Federal government information systems such as the GPO Access System, the NTIS FedWorld system, the National Geospatial Data System, and the Global Change Data and Information System will be accessible to GILS direct users. GILS direct users may have access to a wide range of additional Federal information on the network such as current and historical information on Federal programs and institutions; public notices; law, regulation, policy, and

procedural materials; and listings of experts and office locations. Agencies such as NARA, GPO, and NTIS, as well as private-sector information providers, can supplement the GILS Core with access to other Federal and non-Federal information.

Other government (state, local, tribal, foreign, international) and non-government organizations will also be encouraged to institute locators compatible with the standards used in GILS. GILS will accommodate the expressed needs of other government organizations where practical.

Design Principles

GILS is a component of the National Information Infrastructure (NII) that is evolving with guidance from the Information Infrastructure Task Force. [6] GILS will be interoperable with other component NII initiatives such as the National Spatial Data Infrastructure. GILS is also expected to adapt to and encourage technical innovation, especially in ways that enhance public access to government information.

GILS will conform to national and international standards for information and data processing. Participants in GILS will use voluntary standards processes, e.g., ANSI, the Open Systems Environment Implementors Workshop (OIW), and the Internet Engineering Task Force, to promote interoperability of search and retrieval mechanisms, network communications, user authentication, and resource identifiers, among other essential components. Near-term implementations of GILS will use the Internet and its communications protocols, but GILS is based on the international Open Systems Interconnection (OSI) model to be compatible with a wide range of technologies. NIST, working through the OIW, will maintain and publish the application profile specifying GILS compliance.

GILS takes advantage of the network technology known as client-server architecture, which allows locator records to be distributed among multiple independent information servers. Client applications may allow the user to question many servers concurrently and have the answers automatically combined. In this way, GILS allows for agencies to

maintain GILS locator records within various information resources optimized for their usual customers, while allowing the locator information to be rapidly collated in different ways to serve different needs.

Functional Requirements

Direct users of GILS must be able to use non-proprietary standard mechanisms to discover information sources and retrieve basic textual information content. These functions are within the scope of the information search and retrieval standard known in the United States as ANSI Z39.50 and internationally as ISO (International Organization for Standardization) 10162/10163. GILS locators must be accessible on interconnected electronic network facilities and must support the currently approved ANSI Z39.50 standard for information search and retrieval. Software conforming with ANSI Z39.50 must also conform to the GILS Profile to provide full functionality to GILS direct users. In particular, the GILS Profile provides for navigating among Federal government locators through the specifications given for the GILS Core locator records. Special provisions are made in GILS to support navigation among GILS locators by using browsing as well as textual searching.

The GILS Profile provides a complete specification of GILS as it makes use of ANSI Z39.50, but also specifies where necessary those characteristics of GILS that are not within the scope of ANSI Z39.50. The GILS Profile does not limit how information is maintained at the source nor how the information is displayed to the user. Access to GILS is expected to be embedded within many different computer applications, ranging from the very simple to those that support concept searching across languages, dynamically interpret natural language, or filter search requests to sift huge amounts of information automatically. Public domain client software that supports access to GILS will be available from GPO, NTIS, and the Clearinghouse for Networked Information Discovery and Retrieval, among others.

Alternative ways to organize and present networked information are encouraged, but agencies participating in GILS will implement such alternatives in addition to supporting access by GILS direct users who employ the currently approved ANSI Z39.50 standard. For example, information organized via the OSI X.500 Directory Services standard can be made accessible also via ANSI Z39.50, thereby enhancing access capabilities. It should also be noted that a GILS direct user will typically use client software that provides access to a variety of information sources that do not comply with the GILS profile but are compliant with various other standards.

Some internal redundancy in GILS is to be expected--there will often be multiple GILS locator records describing the same resource and different search strategies applied by different intermediaries. Such redundancy is appropriate because the same information resources may be described differently to different audiences or for different purposes, and descriptions will cover information resources at a wide range of aggregation. Also, the same information resources may be described differently by different information services that participate directly or as intermediaries in providing Federal information to the public. Because GILS incorporates a variety of automated and manual search techniques, questions will be answered from different perspectives depending on how GILS is used.

GPO (and perhaps NARA, NTIS and other agencies) will maintain a publicly accessible GILS source that provides a comprehensive directory of all GILS Core locator records from a Federal perspective. When appropriate to their respective missions, Federal agencies may also develop and maintain additional interagency topical locators that enhance opportunities for sharing information resources. The following are examples of topics that might be the subject of additional interagency locators: economic indicators, trade information, spatial data, educational and training resources, disaster relief, health information, biodiversity and global change research. Such locators would be similar in function to the GILS Core, but would not necessarily use the GILS Core Elements format nor be focused solely on Federal agency holdings.

GILS supports seamless access not only among locators but directly to

referenced information resources. When implemented at both the client and the server, GILS linkages facilitate the electronic delivery of off-the-shelf information products, as well as connection to data systems that support analysis and synthesis of information (Figure 3). Although the trend is clearly in the direction of electronic network availability, much of the referenced information is not available currently in electronic form. GILS always provides information regarding request and delivery procedures for various distribution options as defined by the disseminating organization.

<insert figure 3>
Figure 3. GILS facilitates seamless access among locators and directly to information resources.

The GILS Core

Among the GILS agency components is a set of locator records that reside on GILS accessible servers and are further identified by agencies as belonging to the GILS Core. GILS Core locator records are required to be maintained by Federal agencies having significant information holdings, where each record describes part of the agency holdings. These Core locator records will be accessible comprehensively in the GPO Access system, but can also be aggregated by direct users of GILS to provide selective views of Federal government holdings.

The GILS Core is defined as the set of locator records maintained by the U.S. Federal government, all of which comply with the defined GILS Core Element standards, and all of which are mutually accessible through interconnected electronic network facilities. Each information disseminating agency is responsible for compiling and maintaining its own records in the GILS Core. Information services for access to GILS Core locators, once a direct user has Internet access, will be maintained by Federal agencies without charge to the direct user.

The GILS Core will include records for all information locators that catalog other publicly accessible information resources at least partially funded by the Federal government, as well as for each of the

Federal government information systems that include publicly accessible data or information. While GILS Core records can point to any kind of information source, they are especially designed for helping users navigate among a wide array of other locators in various formats. It is not recommended that agencies use the precise format of the GILS Core locator records to describe all types of information resources. For example, the GILS Core Elements format would be a poor choice for describing each agency expert, but it could well be used to describe the resource that contains a compilation of such descriptions. Rather, the agency should maintain various locator records in formats appropriate to the primary user communities being served. When such other locators are published, the originating agency should include corresponding locator records that enable electronic linkage from and to the GILS Core locator.

The entire GILS Core is not likely to contain more than 100,000 locator records. In addition to locator records for information systems, it is estimated that the GILS Core will contain up to 1,000 locator records for each Federal agency that is a major disseminator of public information. Agencies that are not major disseminators will typically have fewer records in their portion of the GILS Core, especially if the agency is relatively small. Where agencies maintain information inventories that have far more records, the agency is expected to aggregate related information resources in a locator record included in the GILS Core and link the detailed inventory to GILS. Each GILS Core locator record is estimated to be less than 1,000 words in length, exclusive of any agency supplemental information that may be introduced as a separate field at the agency's discretion.

It is important to note that the vast majority of information sources accessible to GILS direct users would not be considered part of the GILS Core. Many are not maintained by the Federal Government, do not offer records in the format of the GILS Core Elements, are not on public networks, or are not offered free of charge. Many of these non-Core sources are locators nonetheless and will be very valuable to users in finding information. Also, other relevant sources of Federal information and Federal government information systems may be accessible to direct users of GILS. For example, various agencies and private-sector

information providers may develop products that contain GILS Core locator records. Indeed, such derivative and value-added products may often be the first point of access to Federal information resources.

The GILS Profile

The decentralized approach envisioned for GILS requires that many different implementations be fully interoperable when implemented, although developed separately. To assure interoperability, implementors of information systems must have a clear statement of the functions of GILS and the environment within which GILS will be used. That statement becomes part of a GILS Profile that documents the specific agreements established by consensus among active implementors together with Federal
representatives. The GILS Profile identifies specific standards, and the chosen subsets, options, and parameters of those standards, needed to achieve interoperability in the specific limited context of GILS.

As an initial step toward a Stable Implementors Agreement recognized by the OIW, a draft profile was created through a Cooperative Agreement between the U.S. Geological Survey and Syracuse University, with active involvement from several ANSI Z39.50 implementors representing non-government sectors. The draft GILS Profile specifies that the GILS locator records are to be available in three record syntaxes--Generic Record Syntax, United States Machine Readable Cataloging (USMARC) [7],
and Simple Unstructured Text Record Syntax (SUTRS).

When using the Generic Record Syntax, the GILS locator elements can support representation in Hypertext Markup Language (HTML). (HTML is the
format interpreted by the National Center for Supercomputing Applications Mosaic client software when presenting World Wide Web objects, for example.) Provision has also been made in the GILS profile to support switching among navigation techniques, including use of a

browsing mode as in Gopher or a searching mode as in bibliographic systems or Wide Area Information Servers (WAIS). The incorporation in GILS of Uniform Resource Identifiers (URIs) greatly simplifies electronic navigation among locators and other data systems available on interconnected networks.

Content definitions describe the GILS Core Elements required for users to determine the relevance of defined information resources to their needs and to understand subsequent actions to obtain the information resources (see Appendix A). These definitions identify relations among GILS Core Elements, and between GILS Core Elements and the USMARC format
for bibliographic data. ANSI Z39.50 definitions of GILS Core Elements in the GILS Profile provide a structure and format for movement of the GILS Core Elements between computer systems. The Abstract Record Syntax and
Basic Encoding Rules used to define GILS Core Elements are also suitable for movement of element contents between automated systems using digital
media such as tape, diskette, or CD-ROM.

The GILS Profile offers a preferred display format for use in printed media as well as in electronic presentations. Although specified for human viewing in English, it is intended to be extensible to other languages also.

Appendix A. GILS Core Elements

Title: This mandatory element occurs once per locator record. It conveys the most significant aspects of the referenced resource and is intended for initial presentation to users independently of other elements. It should provide sufficient information to allow users to make an initial decision on likely relevance. It should convey the most significant information available, including the general topic area, as well as a specific reference to the subject. (USMARC Tag 245$a)

Control Identifier: This mandatory element occurs once per locator record. It is defined by the information provider and is used to distinguish this locator record from all other GILS Core locator records. The control identifier should be distinguished with the record source agency acronym as provided in the U.S. Government Manual. (USMARC Tag 001)

Abstract: This mandatory element occurs once per locator record. It presents a narrative description of the information resource. This narrative should provide enough general information to allow the user to determine if the information resource has sufficient potential to warrant contacting the provider for further information. The abstract should not exceed 500 words in length. (USMARC Tag 520)

Purpose: This mandatory element occurs once per locator record. It describes why the information resource is offered and identifies other programs, projects, and legislative actions wholly or partially responsible for the establishment or continued delivery of this information resource. It may include the origin and lineage of the information resource, and related information resources. (USMARC Tag 500)

Originator: This mandatory element occurs once per locator record. It identifies the information resource originator, named as in the U.S. Government Manual where applicable. (USMARC Tag 710$a)

Access Constraints: This mandatory element occurs once per locator

record, although in some cases this element may contain the value "None." It describes any constraints or legal prerequisites for accessing the information resource or its component products or services. This includes any access constraints applied to assure the protection of privacy or intellectual property, and any other special restrictions or limitations on obtaining the information resource. Guidance on obtaining any users' manuals or other aids needed for the public to reasonably access the information resource must also be included here. (USMARC Tag 506)

Use Constraints: This mandatory element occurs once per locator record, although in some cases this element may contain the value "None." It describes any constraints or legal prerequisites for using the information resource or its component products or services. This includes any use constraints applied to assure the protection of privacy or intellectual property and any other special restrictions or limitations on using the information resource. (USMARC Tag 540)

Availability: This mandatory element occurs one or more times per locator record. It is a grouping of sub-elements that together describe how the information resource is made available.

Distributor: This mandatory sub-element occurs once per Availability element. It identifies the distributor by name, organization, street address, city, state, zip code, country, network address, hours of service, telephone, and/or fax number. (USMARC Tag 037$b)

Resource Description: This optional sub-element occurs nor more than once per Availability element. It identifies the resource as it is known to the distributor. (USMARC Tag 037$f)

Order Process: This mandatory sub-element occurs once per Availability element. It provides information on how to obtain the information resource from this distributor, including any fees associated with acquisition of the product or use of the service, order

options (e.g., available in print or digital forms, PC or Macintosh versions), order methods, payment alternatives, and delivery methods. (USMARC Tag 037$c)

Technical Prerequisites: This optional sub-element occurs no more than once per Availability element. It describes any technical prerequisites for use of the information resource as made available by this distributor. (USMARC Tag 538)

Available Time Period: This optional sub-element may occur multiple times per Availability element. It provides the time period reference for the information resource as made available by this distributor. (Time period formats are as given for the Time Period of Content element described below.)

Available Linkage: This optional sub-element occurs no more than once per Availability element. It provides the information needed to contact an automated system made available by this distributor, expressed in a form that can be interpreted by a computer (i.e., URI). Available linkages are appropriate to reference other locators, facilitate electronic delivery of off-the-shelf information products, or guide the user to data systems that support analysis and synthesis of information. (USMARC Tag 856$u)

Available Linkage Type: This optional sub-element occurs if there is an Available Linkage described. It provides the data content type (i.e., MIME) for the referenced URI. (USMARC Tag 856 first indicator/ 856$2)

Point of Contact for further information: This mandatory element occurs once per locator record. It identifies an organization, and a person where appropriate, serving as the point of contact plus methods that may be used to make contact. Defined sub-elements include name, organization, street address, city, state, zip code, country, network

address, hours of service, telephone, and fax number. (USMARC Tag 856$m
for electronic resources, 535 for non-electronic resources)

Record Source: This mandatory element occurs once per locator record. It identifies the organization, as named in the U.S. Government Manual, that created or last modified this locator record. (USMARC Tag 040)

Date Last Modified: This mandatory element occurs once per locator record. It identifies the latest date on which this locator record was created or modified. (USMARC Tag 005)

Agency Program: This element occurs no more than once per locator record. It identifies the major agency program or mission supported by the system and should include a citation for any specific legislative authorities associated with this information resource. This element is mandatory if the resource referenced by this GILS Core locator record is a Federal information system. (USMARC Tag 500)

Sources of Data: This element occurs no more than once per locator record. It identifies the primary sources or providers of data to the system, whether within or outside the agency. This element is mandatory if the resource referenced by this GILS Core locator record is a Federal information system. (USMARC Tag 500)

Controlled Vocabulary: This optional element may occur multiple times per locator record. It is a grouping of sub-elements that together provide any controlled vocabulary used to describe the resource and the source of that controlled vocabulary.

> Index Terms - Controlled: This sub-element occurs once per Controlled Vocabulary element. It is a grouping of descriptive terms drawn from a controlled vocabulary source to aid users in locating entries of potential interest. Each term is provided in the subordinate repeating field, Controlled Term. (USMARC Tag 650)
>
> Thesaurus: This sub-element occurs once per Controlled Vocabulary element. It provides the reference to a formally registered thesaurus or similar authoritative source of the controlled index terms. (USMARC Tag 650 first indicator/ 650$2) Notes on how to obtain electronic access to or copies of the referenced source should be provided, possibly through a Cross Reference to another locator record that more fully describes the standard and its potential application to locating GILS information.

Local Subject Index: This optional element occurs no more than once per locator record. It is a grouping of descriptive terms to aid users in locating resources of potential interest, but the terms are not drawn from a formally registered controlled vocabulary source. Each term is provided in the repeating sub-element, Local Subject Term. (USMARC Tag 653$a)

Methodology: This optional element occurs no more than once per locator record. It identifies any specialized tools, techniques, or methodology used to produce this information resource. The validity, degree of reliability, and any known possibility of errors should also be described. (USMARC Tag 567)

Spatial Reference: This optional element occurs no more than once per locator record and provides the geographic reference for the information resource. Geographic names and coordinates can be used to define the bounds of coverage. Although described here informally, the spatial object constructs should be as defined in FIPS 173, "Spatial Data Transfer Standard."

> Bounding Rectangle: This optional sub-element occurs no more than once within a Spatial Reference element. It provides the limits of coverage expressed by latitude and longitude values in the order: western-most, eastern-most, northern-most, southern-most. (USMARC Tags 255$c, 034$d, 034$e, 034$f, 034$g)
>
> Geographic Name: This optional sub-element may occur

multiple times within a Spatial Reference element. It identifies significant areas and/or places within the coverage through two associated constructs: a Geographic Keyword Name (USMARC Tag 651) and a Geographic Keyword Type (USMARC Tag 655). A preferred source of the names and types is the Geographic Names Information System.

Time Period of Content: This optional element may occur multiple times per locator record. It provides time frames associated with the information resource, in one of two forms:

Time period - structured: Time described using the USMARC prescribed structure. (USMARC Tag 045$c)

Time period - textual: Time described textually. (USMARC Tag 513)

Cross Reference: This optional element may occur multiple times per locator record. Each instance is a grouping of sub-elements that together identify another locator record likely to be of interest.

Cross Reference Title: This optional sub-element occurs no more than once per Cross Reference element. It provides a human readable textual description of the cross reference. (USMARC Tag 787$t)

Cross Reference Linkage: This optional sub-element occurs no more than once per Cross Reference element. It provides the machine readable information needed to perform the access (i.e., URI). (USMARC Tag 787$w)

Cross Reference Type: This optional sub-element occurs if there is a Cross Reference Linkage described. It provides the data content type (i.e., MIME) for the referenced URI. (USMARC Tag 856 first indicator/ 856$2)

Original Control Identifier: This optional element occurs no more than

once per locator record. It is used by the record source to refer to another GILS locator record from which this locator record was derived. (USMARC Tag 035)

Supplemental Information: This optional element occurs no more than once per locator record. Through this element, the record source may associate other descriptive information with the GILS Core locator record. (USMARC Tag 500)

Appendix B: Glossary

agency - any executive department, military department, government corporation, government controlled corporation, or other establishment in the executive branch of the United States Federal government, or any independent regulatory agency (OMB Circular A-130).

ANSI Z39.50 - The "American National Standard Information Retrieval Application Service Definition and Protocol Specification for Open Systems Interconnection" is developed by the National Information Standards Organization (NISO), accredited to the American National Standards Institute (ANSI). ANSI Z39.50 complies with the Open Systems Interconnection (OSI) family of standards promulgated by the International Organization for Standardization (ISO), and is interoperable with the international standards for information search and retrieval, ISO 10162 and 10163. As of this writing, the currently approved version is ANSI Z39.50 Version 2.

direct user - a person or automated process that accesses GILS from networks using the GILS Profile and thereby having more flexibility to explore the full complement of available information. People who are direct users of GILS are assumed to be literate in English to at least the secondary school level, capable of using a personal computer, and aware of any constraints of their own hardware or software environment.

dissemination - the government initiated distribution of information to the public, excluding distribution limited to government employees or agency contractors or grantees, intra-agency or inter-agency use or sharing of government information, and responses to requests for agency records under the Freedom of Information Act (5 U.S.C. 552) or Privacy Act. Here, "disseminating information" is not distinguished from "providing access to information" (following OMB Circular A-130).

electronic information resource - information resources that are maintained in electronic, digital format and may be accessed, searched, or retrieved via electronic networks or other electronic data processing technologies (e.g., CD-ROM).

government information - information created, collected, processed, disseminated, or disposed of by or for the Federal government (OMB Circular A-130).

Government Information Locator Service (GILS) - a decentralized collection of locators and associated information services used by the public either directly or through intermediaries to find public information throughout the U.S. Federal government.

GILS Core - a subset of all GILS Locator Records which describe information resources maintained by the U.S. Federal government, comply with the defined GILS Core Elements and are mutually accessible through interconnected electronic network facilities without charge to the direct user.

government publication - information that is published as an individual document at government expense, or as required by law (OMB Circular A-130).

information - any communication or representation of knowledge such as facts, data, or opinions in any medium or form, including textual, numerical, graphic, cartographic, narrative, or audiovisual forms (OMB Circular A-130).

information product- any book, paper, map, machine-readable material, audiovisual production, or other documentary material, regardless of physical form or characteristic (OMB Circular A-130).

information resource - includes both government information and information technology (OMB Circular A-130).

information service - considered equivalent to information product from the policy perspective of OMB Circular A-130, although agency locator records for services may differ from those for products.

information system - the organized collection, processing, maintenance, transmission, and dissemination of information in accordance with defined procedures, whether automated or manual (OMB Circular A-130).

information technology - the hardware and software operated by a Federal agency or by a contractor of a Federal agency or other organization that processes information on behalf of the Federal Government to accomplish a Federal function (OMB Circular A-130).

intermediary or intermediate service - an entity or service that makes some of the GILS information available but does not provide the full capabilities of a direct user.

interoperability - a condition that exists when the distinctions between information systems are not a barrier to accomplishing a task that spans multiple systems.

locator - an information resource that identifies other information resources, describes the information available in those resources, and provides assistance in how to obtain the information.

locator record - a collection of related data elements describing an information resource, the information available in the resource, and how to obtain the information.

mandatory element - a data element in a GILS Core Locator Record that must have a value provided by the record source.

Open Systems Interconnection (OSI) - a family of standards promulgated by the International Organization for Standardization (ISO) and adhering to a specific model that promotes interoperability.

profile - the statement of a function(s) and the environment within which it is used, in terms of a set of one or more standards, and where applicable, identification of chosen classes, subsets, options, and parameters of those standards; a set of implementor agreements providing guidance in applying a standard interoperably in a specific limited context.

records management - the planning, controlling, directing, organizing, training, promoting, and other managerial activities involved with respect to records creation, records maintenance and use, and records

disposition in order to achieve adequate and proper documentation of the policies and transactions of the Federal government and effective and economical management of agency operations. (44 U.S.C. 2901(2))

Uniform Resource Identifier (URI) - a set of related standards for encoding resource location and identification information for electronic and other objects. Examples include Uniform Resource Locators (URLs) and
Uniform Resource Names (URNs).

USMARC - an implementation of ANSI/NISO Z39.2, the American National Standard for Bibliographic Information Interchange. The USMARC format documents contain the definitions and content designators for the fields that are to be carried in records structured according to Z39.2. GILS records in USMARC format contain fields defined in USMARC Format for Bibliographic Data. This documentation is published by the Library of Congress.

NOTES:

[1] Clinton, William J. & Gore, Albert, Jr., (1993, February 22). Technology for America's Strength, A New Direction to Build Economic Strength. Washington, DC: Government Printing Office.

[2] National Information Standards Organization. (1992). ANSI/NISO Z39.50-1992, Information Retrieval Application Service Definition and Protocol Specification for Open Systems Interconnection. Gaithersburg, MD: National Information Standards Organization Press.

[3] McClure, Charles R., & Moen, William E. (1994). Expanding Research and Development on the ANSI/NISO Z39.50 Search and Retrieval Standard.
Syracuse, NY: School of Information Studies, Syracuse University.

[4] Service to the Citizen Interagency Task Force. (1993). Service to the Citizen Conference Report. Washington, DC: Department of Veterans Affairs.

[5] The design of GILS follows generally a 1992 report to OMB, NARA, and the General Services Administration (GSA): McClure, Charles R., Ryan, Joe & Moen, William E. (1992). Identifying and Describing Federal Information Inventory/Locator Systems: Design for Networked-based Locators 2 Vols. Bethesda, MD: National Audio Visual Center. [Available from ERIC, document no. ED349031].

[6] Information Infrastructure Task Force (September 15, 1993). The National Information Infrastructure: Agenda for Action. Washington, DC: NTIA NII Office, Department of Commerce. Available in ASCII text format under the file name niiagend.asc on the NTIA Bulletin Board (202) 482-1199 and the Fedworld bulletin board (703-321-8020). It is available on the Internet under the file name niiagenda.asc by anonymous FTP (File Transfer Protocol) at host ftp.ntia.doc.gov under the directory /pub, and by gopher at gopher.nist.gov in the menu item DOC Documents.

[7] USMARC is an implementation of ANSI Z39.2. American National Standards Institute. (1985). American National Standard Z39.2-1985

Bibliographic Information Interchange. New York, NY: American National Standards Institute. See also USMARC Format for Bibliographic Data. Washington, DC: Cataloging Distribution Service, Library of Congress.

Available online: ftp://www.cni.org/pub/gils/ accessed 09/15/01 paa

APPENDIX C
44 U.S.C. 3511
ESTABLISHMENT AND OPERATION OF GOVERNMENT INFORMATION LOCATOR SERVICE

Below is the text of the Paperwork Reduction Act that mandates the development of the Government Information Locator Service. This text is taken from the Conference Report, House Report 104-99:

§ 3511. Establishment and operation of Government Information Locator Service

(a) In order to assist agencies and the public in locating information and to promote information sharing and equitable access by the public, the Director shall—

(1) cause to be established and maintained a distributed agency-based electronic Government Information Locator Service (hereafter in this section referred to as the 'Service'), which shall identify the major information systems, holdings, and dissemination products of each agency;

(2) require each agency to establish and maintain an agency information locator service as a component of, and to support the establishment and operation of the Service;

(3) in cooperation with the Archivist of the United States, the Administrator of General Services, the Public Printer, and the Librarian of Congress, establish an interagency committee to advise the Secretary of Commerce on the development of technical standards for the Service to ensure compatibility, promote information sharing, and uniform access by the public;

(4) consider public access and other user needs in the establishment and operation of the Service;

(5) ensure the security and integrity of the Service, including measures to ensure that only information which is intended to be disclosed to the public is disclosed through the Service; and

(6) periodically review the development and effectiveness of the Service and make recommendations for improvement, including other mechanisms for improving public access to Federal agency public information.

(b) This section shall not apply to operational files as defined by the Central Intelligence Agency Information Act (50 U.S.C. 431 et seq.).

APPENDIX D
SAMPLE GILS RECORDS

Below are three sample records that present the character of records typical of the collection of Government Information Locator Records. The first record describes a government agency regional library, the Information Resource Center of the Environmental Protection Agency's Region 7 in Kansas City, Kansas. The second example is a GILS record describing a particular document, the Department of State's *A Guide to Doing Business With the Department of State*. The final sample included here is a description of a record describing the GILS records of an agency as a collection.

Sample 1: A Library

Title: Environmental Protection Agency - Region 7 Information Resource Center
Acronym: IRC
Originator:
Environmental Protection Agency
Environmental Policy Center, Region 7
Planning and Management Information Systems
Information Services Section

Controlled Vocabulary (Library of Congress Subject Headings):
Agriculture; Air quality; Environmental law; Environmental Protection Agency; Environmental sciences; Government publications; Hazardous wastes; Information services; Information technology; Libraries; Online databases; Pesticides; Technical reports; Water quality; Wetlands
Controlled Vocabulary (Hazardous Waste Superfund Database Thesaurus):
Information sources; Solid wastes
Local Subject Term: US Federal GILS
Abstract: EPA Region VII includes the states of Missouri, Kansas, Iowa and Nebraska. The Information Resource Center provides information to EPA staff, the regulated community, educators, and citizens on the following subject areas: Agriculture; Air; Pollution; Hazardous Waste; Pesticides; Solid Waste Management; Water Pollution; and, Wetlands. The IRC holdings consist of 2200 books, 15,000 documents and technical

reports, 150,000 microfiche documents, and 140 journal subscriptions. The IRC orders books, documents, reports, and subscriptions for a legal library, a laboratory library and a training library. Cataloging is done on OCLC and is entered onto OLS, the EPA Online Library System. Materials circulate for 3 weeks. Interlibrary loans are processed through OCLC or accepted by phone or fax. Reference service includes access to DIALOG, FirstSearch, and LAN access to CD ROM tools which include: CFRs, Federal Register, US Code, TOMES, TRI, Pestbank, Environmental Law Review, Shadow Law, TOSCA, and EPAdoc, Phone Disc, Rods, SW846 and AirChief. The IRC has a user station with dedicated access to Internet, a scanner, microfiche viewer/printer, a CD workstation, and several PCs.

Purpose: The purpose of the IRC is to provide accurate, efficient, and timely access to environmental issues and regulations.

Agency Program: Not supplied

Spatial Reference:

Geographic Keyword Name (Library of Congress Subject Headings): Missouri; Kansas; Iowa; Nebraska

Spatial Reference:

Geographic Keyword Name (Harzardous [sic] **Waste Superfund Database Thesaurus):** Region 7

Time Period of Content: Time Period-Structured: Not supplied

Time Period-Textual: Not supplied

Availability:

Distributor:

Name: Information Resource Center
Organization: Environmental Protection Agency Region 7
Street Address: 726 Minnesota Avenue
Mail Code: None
City: Kansas City
State: KS
Zip Code: 66101-2728
Country: USA

Network Address: library.reg7@epamail.epa.gov
Hours of Service: 10:00 a.m. - 3:00 p.m. (CST) M - F (walk-in)
8:30 a.m. - 5:00 p.m. (CST) M - F (phone)
Telephone: 913-551-7241
913-551-7358
Fax: 913-551-7467
Resource Description: Pollution Prevention Bibliography, EPA 907/B-94/001
Order Process: Call, write or fax the IRC to request a copy.
Technical Prerequisites: None
Available Linkage: None
Available Linkage Type: None

Sources of Data: Not supplied
Access Constraints: None
Use Constraints: None
Point of Contact:

Name: Sandra Isaacson, Librarian (Contractor)
Organization: Environmental Protection Agency Region 7
Street Address: 726 Minnesota Avenue
Mail Code: None
City: Kansas City
State: KS
Zip Code: 66101
Country: USA

Network Address: isaacson.sandra@epamail.epa.gov
Hours of Service: 8:30 a.m. - 5:00 p.m. (CST) M - F
Telephone: 913-551-7358
Fax: 913-551-7467
Schedule Number: Not applicable
Control Identifier: EPA/ACCESS00222
Record Source:
Environmental Protection Agency
Environmental Policy Center, Region 7
Planning and Management Information Systems
Information Services Section
Date of Last Modification: 19961218
URL: http://www.epa.gov/earth100/records/a00222.html

Sample 2: A Particular Document

Title: A Guide to Doing Business With the Department of State

Abstract: The Guide provides general information for small business contractors on Deparrtment [sic] of State small business practices.

Purpose: The Guide is a reference of general Department of State information for small contractors.

Originator:

Department/Agency Name: US Department of State
Major-Org.-Subdivision: Bureau of Administration
Name-of-Unit: Office of Small and Disadvantaged Business Utilization

Resource-Description: A Guide to Doing Business With the Department of State

Schedule-Number: Not scheduled

Local-Subject-Index: US Federal GILS; US Department of State;

Cross-Reference:

Cross-Reference-Title: This material is also available electronically via Internet Gopher: DOSFAN.LIB.UIC.EDU or via Internet

Sources-of-Data: Material gathered and edited by A/SDBU staff.

Availability:

Distributor:

Organization: US Department of State
Name-of-Distributor: Office of Small and Disadvantaged Business Utilization
Street-Address: State Annex 6
City: Washington
State: DC
Zip-Code: 20522-0602
Country: USA
Phone (703)875-6824
Fax: (703)875-6825

Network-Address: Electronic Bulletin Board Service, 703-875-4945
Hours-of-Service: 0815-1700 EST M-F

Order-Process: Contact the above distributor or call the Bulletin Board Service at 703-875-4945

Available-Time-Period:
Time-Period-Textual: Published as needed, or as regulations change

Technical-Prerequisites: No Technical Prerequisites

Linkage: http://dosfan.lib.uic.edu/dosfan.html

Linkage-Type: URL

Point-of-Contact:
Organization: US Department of State
Major-Org.-Subdivision: Bureau of Administration
Name-of-Unit: Small and Disadvantaged Business Utilization
Name-of-Contact: Office of Small and Disadvantaged Business Utilization
Street-Address: State Annex 6, Room 633
City: Washington

State: DC
Zip-Code: 20522-0602
Country: USA
Telephone: (703)875-6824
Fax: (703)875-6825
Hours-of-Service: 0815-1700 EST M-F

Access-Constraints: Unrestricted
Documentation: No documentation is available

Use-Constraints: Unrestricted
Record-Source: US Department of State

Control-Identifier: USDS951026125934

Supplemental:

Record-Type: Information Product
Comments: This material is also available electronically via Internet Gopher: DOSFAN.LIB.UIC.EDU or via Internet WEB:

HTPP://DOSFAN.LIB.UIC.EDU/DOSFAN.HTML

Status: Validated

Date-of-Last-Review: 951102123002

Date-of-Last-Modification: 19951102

Sample 3: A Collection of GILS Records

TITLE: General Services Administration Government Information Locator Service
Acronym: GILS
Originator
Department/Agency Name: General Services Administration (GSA)
Major Organizational Subdivision: Office of the Chief Information Officer (CIO)
Minor Organizational Subdivision: Office of Planning and Information Architecture
Name of Unit: Center for Information Technology Capital Planning
Contributor:
Date of Publication:
Date of Publication Structured:
Date of Publication:
Place of Publication:
Language of Resource:

ABSTRACT: GSA's GILS is like a library card catalog. It describes information created and used by GSA and how to get it. GSA's information sources include: GSA's information dissemination products such as pamphlets, catalogs, bulletin board systems, and GSA's home page on the World Wide Web and internet: GSA's automated information systems which provide critical support to GSA's missions and functions, and GSA's Privacy Act Systems. Some of the GILS records may point to or be electronically linked to other records for additional information. The information described in GILS is used by GSA to accomplish its legally mandated mission. GSA was established on July 1, 1949, to provide a wide variety of management and related services for the Federal Government. The Federal Property and Administrative Services Act of 1949 (63 Stat. 379), which created GSA, stemmed from recommendations contained in the first Hoover Commission report and other studies aimed at bringing about improvements and economies in management practices. The Act consolidated functions formerly assigned to various agencies including personal property management, real property management, records management, and transportation and public utilities management. Later, additional programs were assigned to GSA, such as motor vehicle management. Certain programs also were transferred from GSA to other agencies. Records management, for example, was transferred to the National Archives and Records Administration by Public Law 98497 on April 1,. GSA is organized into services which carry out program operations and staff offices which provide staff services. The Central Office, GSA, is located in the Washington, DC, metropolitan area. GSA's regional offices are established in 11 cities throughout the United States on a geographical jurisdiction basis. Because of its diverse mission and responsibilities, GSA's
information resources are of interest to three distinct audiences: Federal Agencies, private sector firms and contractors, and the general public. GSA information sources for Federal agencies tell about goods or services GSA provides. Sources for businesses tell how to become a supplier of goods and services to GSA and other Federal agencies. Sources for

the public explain how GSA sells cars, old computers, houses, and other items or how to use GSA's public programs.
Begin Date: 1995
End Date:
Controlled Subject Index:
Subject Thesaurus:
Subject Terms Controlled:
Controlled Term:
Subject Terms Uncontrolled:
Uncontrolled Term:
Spatial Domain:
Bounding Coordinates:
West Bounding Coordinate:
East Bounding Coordinate:
North Bounding Coordinate:
South Bounding Coordinate:
Place:
Place Keyword Thesaurus:
Place Keyword:
Time Period
Time Period Textual:
Time Period Structured:
Beginning Date:
Ending Date:
Availability
Medium:
Distributor:
Distributor Name: Office of Planning and Information Architecture
Distributor Organization: General Services Administration (GSA)
Distributor Street Address: 18th and F Streets NW
Distributor City: Washington
Distributor State: DC
Distributor Zip Code: 20405
Distributor Country: USA
Distributor Hours of Service: 8:00 a.m. - 4:30 p.m.
Distributor Telephone: 202-219-3062
Distributor Fax:
Resource Description:
Order Process
Order Information: GILS information is available in hardcopy or via the Internet. Requests for printouts of GILS information should be submitted by telephone or in writing to the address or telephone number shown in the distributor fields. Requests for the information described in GILS should be submitted to the Distributors shown in the GILS

record for the information resource.
Cost: Free.
Cost Information: Access to GILS via Internet is free of charge. Paper copies are also free of charge.
Technical Prerequisites: Appropriate internetworking software.
Available Time Period
Available Time Textual:
Available Time Structured:
Available Linkage: http://www.access.gpo.gov/su_docs/gils/gils.html
Linkage Type: text/html
Linkage:

SOURCES OF DATA: Services and Staff Offices within GSA.

Methodology:
Access Constraints

GENERAL ACCESS CONSTRAINTS: None to GSA GILS information resources. There may be access restrictions to information systems containing Privacy Act, procurement, or financial sensitive data.
Originator Disseminator Control:
Security Classification Control:

USE CONSTRAINTS: None to GSA GILS information resources. There may be use restrictions to information systems containing Privacy Act, procurement, or financial sensitive data.

Point of Contact for Further Information
Contact Name: Office of Planning and Information Architecture
Contact Organization: Office of the CIO
Contact Street Address: 18th and F Streets NW
Contact City: Washington
Contact State: DC
Contact Zip Code: 20405
Contact Country: USA
Contact Hours of Service: 8:00 a.m. - 4:30 p.m.
Contact Telephone: 202-219-3062
Contact Fax:

SUPPLEMENTAL INFORMATION: System Products Disposition

PURPOSE: GILS was created to provide the public, private sector businesses, and other government agencies easily accessible descriptions of GSA's information holdings and how

to obtain access to them.

AGENCY PROGRAM: GILS was implemented in support of GSA's information resources management functions, pursuant to the requirements of the Paperwork Reduction Act of 1995.

Cross Reference:

CROSS REFERENCE TITLE:
Cross Reference Relationship:
Linkage Type:
Linkage:
Schedule Number:

CONTROL IDENTIFIER: GSAX000

ORIGINAL CONTROL IDENTIFIER: Record Source
Department/Agency Name: General Services Administration (GSA)
Major Organizational Subdivision: Office of the Chief Information Officer (CIO)
Minor Organizational Subdivision: Office of Planning and Information Architecture
Name of Unit: Center for Information Technology Capital Planning
Language of Record:

DATE OF LAST MODIFICATION: 19990217

Record Review Date: 20000201

APPENDIX E
MESSAGE TO THE GILS FORUM

From John_Paulk@ccmail.osti.gov Wed Nov 2 16:16:36 1994
Received: from adonis.osti.gov by a.cni.org id <AA05454@a.cni.org>; Wed, 2 Nov 1994 16:13:08 -0500
Received: from ccmail.osti.gov by ADONIS.OSTI.GOV (PMDF V4.3-8 #5166) id <01HJ0D9KUSDS90MWJ9@ADONIS.OSTI.GOV>; Wed, 02 Nov 1994 16:13:26 -0400 (EDT)
Date: Wed, 02 Nov 1994 16:04 -0400 (EDT)
From: John_Paulk@ccmail.osti.gov
Subject: GILS Servers
To: GILS@CNI.ORG
Message-Id: <01HJ0D9KVIR690MWJ9@ADONIS.OSTI.GOV>
Mime-Version: 1.0
Content-Type: TEXT/PLAIN
Content-Transfer-Encoding: 7BIT

Hi!

I'm a new subscriber to this list and am relatively new to GILS, so please forgive me if I ask questions that may be considered general knowledge by the group. I have been asked to attempt to find answers to the following questions, and this seems like an excellent place to start:

1. Who has GILS servers? This question is not about "products"; we are interested in knowing who (if anyone) has mounted a true GILS server that complies with the Z39.50v2 GILS profile.

2. How does one access a GILS server?

3. Who is developing a true GILS server?

4. Who will(is) provide(providing) an http/Z39.50v2 GILS profile compliant gateway?

5. How much GILS functionality will be preserved by gateways? The GILS profile includes optional features which address

important functionality for value added GILS clients and servers. For example, will gateways simulate GILS browsing? Will a gateway parse a GILS GRS record for linkages that can be presented meaningfully to the user, so, for example, the user can connect to a related resource?

6. What is the anticipated granularity of a GILS record? Would it consist of a single record describing a Web server, for example, or possibly hundreds of records describing individual resources?

I do realize that some of these questions are quite broad, but I would appreciate any help that the members of the list might be willing to provide.

Thanks!

John Paulk
United States Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, Tennessee 37830

Tel: (615) 576-6784
Fax: (615) 576-2865

john.paulk@ccmail.osti.gov

I, Patricia A. Antrim, hereby submit this dissertation to Emporia State University as partial fulfillment of the requirements for a doctoral degree. I agree that the Library of the University may make it available for use in accordance with its regulations governing materials of this type. I further agree that quoting, photocopying, or other reproduction of this document is allowed for private study, scholarship (including teaching) and research purposes of a nonprofit nature. No copying which involves potential financial gain will be allowed without written permission of the author.

Patricia A. Antrim

Signature of Author

May 10, 2002

Date

GILS, THE GOVERNMENT INFORMATION LOCATOR SERVICE: OBSERVING THE DEVELOPMENT OF A NEW GOVERNMENT INFORMATION SERVICE

Title of Dissertation

Mary Cooper

Signature of Graduate Office Staff

5-13-02

Date Received