

James Ovitt. Should GPO Pay for Positioning on Google?: Undergraduates' Success in Locating U.S. Government Information on the Web. A Master's paper for the M.S. in L.S. degree. November, 2003. 49 pages. Advisor: Garry J. Marchionini

This paper describes an exploratory study of undergraduate students' success in locating U.S. government information on the Web. The purpose of this study was to gain a better understanding of how undergraduates look for government information on the Web and to examine the problems they encounter.

Ten undergraduate students at the University of North Carolina at Chapel Hill were recruited to participate in Web searching sessions. Participants were required to locate documents and find answers to imposed questions requiring U.S. government information available on the Web. Participants answered an average of 1.7 out of four (42.5%) questions correctly. They had greater success with predictable source questions than with unpredictable source questions. Participants initiated 35 out of 40 total search tasks with a Google search. Domain knowledge, working with dates, and locating key government search interfaces such as GPO Access, Thomas, American FactFinder, and the National Center for Education Statistics homepage affected success.

Headings:

Government information -- databases

Government information -- Internet resources

Use studies -- Internet searching

SHOULD GPO PAY FOR POSITIONING ON GOOGLE?: UNDERGRADUATES'  
SUCCESS IN LOCATING U.S. GOVERNMENT INFORMATION ON THE WEB

by  
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A Master's paper submitted to the faculty  
of the School of Information and Library Science  
of the University of North Carolina at Chapel Hill  
in partial fulfillment of the requirements  
for the degree of Master of Science in  
Library Science.

Chapel Hill, North Carolina

November, 2003

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## INTRODUCTION

The Federal Depository Library Program (FDLP), through its network of over 1200 participating libraries in every state, is responsible for ensuring that citizens have access to published U.S. government information in a variety of formats: print, microform, CD-ROM, and via the Internet. For nearly a decade, the Government Printing Office (GPO) which administers FDLP has been striving to disseminate more information over the Internet (e.g., Aldrich, Cornwell, & Barkley, 2000). Steady progress has been made. As of April 2003, 240,000 titles are available electronically through GPO Access (Davis, 2003), and two-thirds of new titles are available electronically only (Baldwin, 2003). GPO is committed to increasing electronic-only distribution to 95% of its publications by 2008 (Russell, 2003a). In announcing a fact finding period to consider ways to restructure the FDLP in April of this year, Judy Russell, the newly appointed Superintendent of Documents, sought ideas “to make it worthwhile for libraries to participate in the FDLP...when all or virtually all of the material can be obtained free from the Internet” (Russell, 2003b, p.7).

Electronic distribution of government information provides undeniable benefits to citizens and government entities including: lower cost distribution, rapid release of data, access to wider audiences, and free and convenient access to information for citizens with computers (e.g., Laskowski, 2000). A remaining challenge, however, is providing assistance to citizens in navigating the complexities of government information in its many forms, subject areas, and locations. Historically, libraries in the FDLP have been

delegated by GPO to provide this expertise and assistance (Barnum, 2002).

Today, in spite of the possibility of profound change to the depository library program, little is known about how well citizens are able to find the government information<sup>1</sup> they need using the Internet. Few studies have observed how people actually search for government information online. Does “connectivity equal access,” or do limited searching skills and the need for domain knowledge in the complex field of government information impose significant barriers to access?

This paper presents a descriptive study that examines the question of access to government information for a small subset of the population, undergraduate students at the University of North Carolina at Chapel Hill (UNC-CH). The specific research questions this study explores are: To what extent are undergraduate students successful in locating government information for use in their academic work, using the Web? What search strategies do they employ, and what problems do they encounter? Answers to these questions will be of use to instruction and reference librarians in an academic setting. This research will help to clarify the need for continued librarian assistance for citizens seeking government information, and may encourage further research to assess the Web searching abilities of other groups of citizens seeking government information online.

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<sup>1</sup> Throughout this study, “government information” refers to U.S. federal government information unless otherwise indicated.

## RELEVANT LITERATURE

While many articles exist that describe online government information resources, few studies attempt to evaluate the success of users in finding government information using the Web. Existing studies that shed light on citizen use of online government information include user surveys, and usability studies and transaction log analyses of specific Web sites.

Studies comprised of user surveys report the most success of citizens accessing government information online. As part of the Pew Internet & American Life Project, Larsen and Rainie (2002) describe increased use of federal, state and local government Web sites by U.S. citizens. Based on telephone polls of 2,391 and 850 adults conducted in 2001, they conclude that 68 million adults have visited some kind of government Web site at least once. Citizens accessed Web sites for a variety of reasons, including: to obtain information on tourism (77%), do research for work or school (70%) and download forms (63%). But also, 62% of respondents reported using government Web sites to obtain information on public policy issues or issues of personal concern. Fully 80% of the respondents reported accomplishing their intended purposes online.

Rockwell (1998) surveyed 51 city and regional planning graduate students about their use of government statistical data on CD-ROM and the Internet. Users reported high degrees of success in using both CD-ROM (100%) and the Internet (96%). Success was associated with library instruction in both mediums and with librarian assistance in searching on CD-ROM.

Ren (1999), in a survey of 81 small business executives in New Jersey, found that

experience and confidence with Internet searching, access to the Internet, and age were all factors contributing to greater use of government information online. Younger respondents reported greater use of the Internet for seeking government information, and previous experience led to more success.

Croft, Cook, and Wilder (1995) provided a report of access to THOMAS (<http://thomas.loc.gov>), the legislative information database maintained by the Library of Congress, intended to be the “public distribution point” for Congressional information (p.19). While largely concerned with describing the then new database and information retrieval system, and discussing methods of relevance ranking, the authors provided some statistics of usage for the period January 6, to March 20, 1995. The most interesting statistic to the present study is the number of query page accesses compared to queries initiated. There were 196,724 accesses to the query page, but only 94,911 subsequent queries initiated. (p. 21). As, Jansen and Pooch (2001) point out, it would be interesting to know why approximately 50% of users did not search for legislative information after accessing the search page. (p. 238). Success in accessing a Web site that contains needed information is a useful indicator to measure, in addition to actually retrieving an answer.

Marchionini (2002) described work undertaken from 1996 to 2001 with Carol Hert and Stephanie Hass, exploring a host of issues pertaining to users’ access to statistical information from the Bureau of Labor Statistics (BLS) Web site. Usability studies, interviews, focus groups, analysis of email requests, transaction log analyses, and interface design were among the components of several studies designed to improve access to statistical information. Analysis of transaction logs indicated that by 2000, “Most users are nonspecialist, causal users who visit the site only occasionally and then

for relatively short periods of time, and often access BLS from home” (p.1205).

Interviews with BLS employees indicated many users submit requests for information that is not available from the agency.

Larson and Rainie (2002) and Rockwell (1998) cited above, both describe impressive success rates for participants locating the government information they need. But both studies rely on the recollection and self-reporting of respondents. Actually observing citizens as they search for government information on the Web, following their search strategies, and assessing their success, may provide an additional perspective.

A number of more general studies of Web searching provide context and insight into relevant indicators for measurement. Anderson (1999), and Wang, Hawk, and Tenopir (2000), both advocate the use of usability lab equipment to capture rich information about users’ search processes. Citing a need to “observe the ‘real’ process as it happens, not merely the outcomes of a process,” Wang, Hawk, and Tenopir devised a synchronized video, audio, keystroke capture system to record a users’ verbalizations as well as trace their progress during a Web search (p. 232). Among the indicators the authors measured that are relevant to the present study were: did the participant find an answer, was it correct, URLs visited, time spent, search engine employed, use of Boolean operators, and number of results examined.

Dennis, Bruza, and McArthur (2002) studied Web searching effectiveness as a function of search paradigm: keyword, directory, and assisted keyword (phrase based query reformulation). Among the indicators they measured were: time spent to answer, number of queries, and time in search states (including search page, results page, document inspection).



Transaction log studies involving very large numbers of queries submitted by anonymous users provide useful outlines of Web use. Jansen, Spink, and Saracevic (2000) analyzed 51,473 queries by Excite users. They recorded data on queries per session, number of results pages viewed, number of terms per search, frequency of search term, and use of logical operators. They found a mean number of queries per user of 2.8, an average number of search terms of 2.21, and that over half of users did not go beyond the first page of results. (p. 224-225). Spink, Wolfram, Jansen, and Saracevic (2001) extended their analysis to over one million queries in 2001 and found similar tendencies toward short queries, and little browsing of results beyond the first page. Jansen and Pooch (2001) in their review of Web searching studies suggest that a common framework of measures for future studies be adopted, and that these include data describing session, query, and number of search terms.

## **METHODS**

### **Brief Summary**

This was a descriptive study that examined the extent to which undergraduate students at the University of North Carolina at Chapel Hill were successful in locating government information using the Web. Ten students were recruited by email to participate in a three part study. A pre-test questionnaire was used to collect background information about participants' age, gender, academic status, and experience searching for information on the Web. A Web searching test was administered in which each participant was asked to locate documents and supply answers to four questions requiring U.S. government information, available online. The participants' searches were recorded using videotape and screen-recording software. In a post-test interview, each participant was asked to discuss their searching process. Analysis centered on measuring success in locating government information and looking for associations between searching success and search strategies.

### **Participant Selection**

Participants were recruited from a random sample of undergraduate students obtained from the University Registrar's Office. Potential participants were contacted by email and offered \$20 to participate in the study. (See recruitment message Appendix A). Appointments were arranged with respondents until 10 sessions had been completed. All study sessions took place in the month of September, 2003.

### **Search Question Development**

Because the subject population was comprised of undergraduate students, search questions were developed that sought the kinds of government information undergraduates might be expected to need in their academic work. Interviews were conducted with four reference and instruction librarians at UNC-CH with subject expertise in government information. They were asked to list the types of questions involving government information that they most frequently encountered when assisting undergraduates at the reference desk, and while conducting library instruction classes. The librarians reported that most questions fell into two broad categories: information about legislation, and statistical information on a variety of social and economic issues. Among those subjects most frequently mentioned were:

Legislative Information:

- Text of bills
- Text of hearings
- Text of laws
- Text of treaties
- Legislative history
- Floor remarks
- Voting records
- Committee membership

Statistics:

- Population
- Housing
- Employment
- Income
- Secondary education
- Post-secondary education
- Consumer price index
- Producer price index
- Election results
- Health data

Other:

- Text of regulations
- Supreme Court decisions

Question topics were drawn from this list.

All search tasks developed for this study (see Appendix B) involved closed questions where participants sought one correct answer or document, as opposed to open questions that ask searchers to find any number of relevant sites or documents related to a topic. Looking for answers to closed questions represents only one type of information seeking behavior, but it gives clear indications of users' success and facilitates comparisons of search strategies.

White and Iivonen (2001, 2002) classified Web searching questions primarily on the basis of their open/closed nature and predictability of the source of the answer. Questions with predictable sources were judged easier by searchers. A question was deemed to have a predictable source if "a specific proper name that can be readily associated with a Web site is included in the question" (2000, p. 211). In this study two questions, Question 1 about the Consumer Price Index and Question 2 about the Census, had predictable sources. It was hypothesized that searchers would have more success answering these questions. All questions involved multiple facets or concepts, but the number of concepts varied. It was hypothesized that participants would have more difficulties with questions with larger numbers of concepts.

Other factors that were expected to affect participants' searching success included performance of search interfaces on government Web sites, and subject knowledge of question topics. Also, it was hypothesized that most searches would be initiated with a Google search and that system characteristics of the search engine would impact searching success.

## **Study Procedures**

All study sessions took place in the School of Information and Library Science (SILS) Interaction Design Lab at UNC-CH. Participants were scheduled for individual, one hour sessions at their convenience. When each participant arrived, study procedures were explained and participants were asked to sign an informed consent agreement (Appendix C). Participants completed a pre-test questionnaire which was designed to gather basic information including age, gender, and academic status, as well as information about participants' use of the Web for academic and other purposes (Appendix D).

A Web searching test was administered in which each participant was asked to locate documents and supply answers to four questions requiring U.S. government information, available online. All searching tests were conducted on the same computer. Internet Explorer 6.0 was open at the University's homepage, which was configured as the browser's default homepage. History and cache files were deleted before each participant arrived. Participants received one question at a time and searches were terminated when the student had answered the question, decided to stop searching, or when allotted time had expired. The process was repeated for each question. The time allowed for each question was nine minutes, which allowed for the possibility of exploring four different search tasks, while still finishing the session (including the questionnaire and brief interview) in one hour. In answering questions, participants were encouraged to use the Web in any way they chose, but they were required to find answers on official U.S. government Web sites. The searching process was recorded using Camtasia Studio 1.1 which creates high quality, full-motion, screen video files with time

stamps. The program uses an efficient, “lossless” CODEC, creating files that are of a manageable size. (A 10 minute movie at 15 frames/sec of a 1024 x 768 pixel screen ranged from 35 to 75 MB, depending on the amount of motion and detail in a particular search.) A backup recording was made from the computer’s video output to videotape.

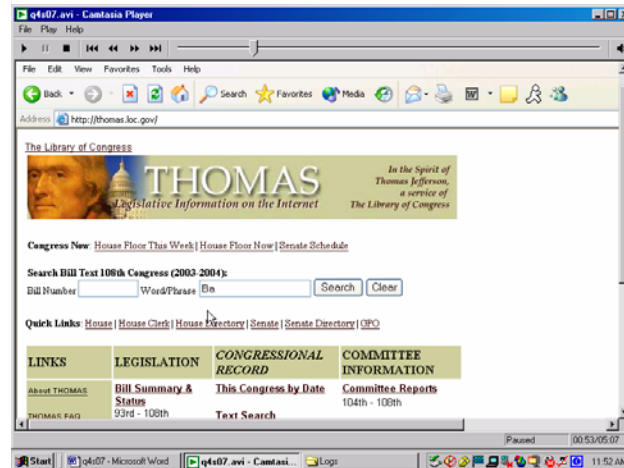
After the searching tasks were completed, participants were questioned about their search strategies and outcomes in a brief interview (see Appendix E). The perceived difficulty of the questions, and usefulness of key government Web sites were also discussed. If time allowed, recorded files were revisited for clarification. Interviews were recorded and transcribed.

### **Data and Analysis**

Digital video files are of great value in studying how people search the Web. Each file is a documentary film of the search process, capturing every mouse movement, each hesitation, every scroll of the screen. The researcher has the luxury of going back to the video at any time to extract additional information about the search, as a new question or idea arises.

For each search task, documents were created that provided a rich picture of the participant’s search process. Time, queries entered, results examined, and URLs visited, were noted. Screen shots of important moments were added to the file as well as the researcher’s comments about what was happening. Following is an excerpt from a typical file:

(00:10) Begin typing url  
 Google  
 (00:38) Query1 = US Bills  
 (00:43) Chose Thomas



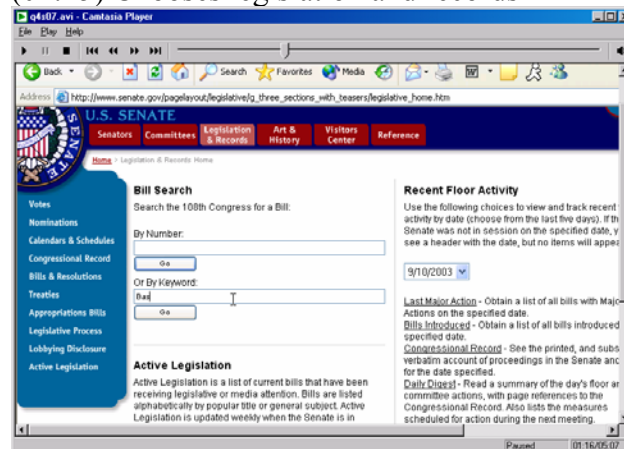
Started to type baseball in Word/Phrase  
Stopped.

Browsed around the page.

Chose link to the Senate.

(01:11) Senate

(01:15) Chooses legislation and records



Starts to type baseball, stops

Chooses how to find bills

Tells you to go to thomas or gpo

(01:42) back to thomas

(02:02) chose bill summary and status

(02:12) Query 2 =baseball (still in 108<sup>th</sup> Congress)

When reviewing searches, if further clarification was required, the video files were opened and played in real time.

Searches were analyzed to extract the following information:

- Did participant supply an answer?
- Was the answer correct?
- Time to answer
- Initial strategy: search engine, directory, direct URL
- Search engine(s) used
- Number of queries
- Number of search terms per query
- Did subject reach the Web site that contained the needed information?
- Did the subject reach the Website homepage that facilitated searching or browsing for the needed information?
- Time to Web site
- Time to homepage

Analysis centered on measuring success in locating government information and looking for associations between searching success and search strategies.



## RESULTS AND DISCUSSION

### Pre-test Questionnaire Findings

The six women and four men who took part in the study had an average age of 19.8 years, with at least two members from each academic year represented. Of the eight participants with declared or intended major fields of study, six reported majors in the social sciences, one in studio art, and one in nursing and Spanish. (see Table 1).

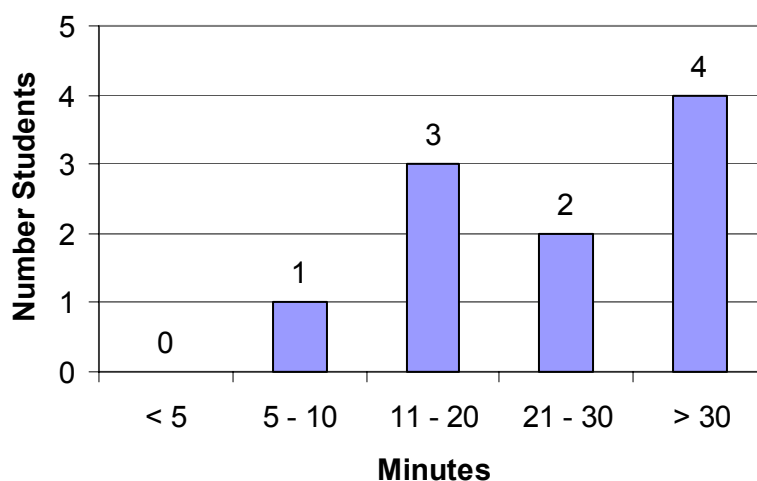
**Table 1: Participant Characteristics**

Number	Sex	Age	Year	Major
01	Female	18	Freshman	Undecided
02	Female	22	Senior	Economics/ PolySci
03	Male	21	Senior	Economics
04	Male	19	Sophomore	Psychology
05	Male	18	Freshman	Psychology
06	Female	22	Senior	Sociology
07	Male	18	Sophomore	Undecided
08	Female	20	Junior	Nursing/Spanish
09	Female	20	Junior	Studio Art
10	Female	20	Junior	Intenational Studies
10 Participants	6 Females 4 Males	Mean Age: 19.8 Median Age: 20 Min Age: 18 Max Age: 22	2 Freshmen 2 Sophomores 3 Juniors 3 Seniors	

Participants were asked several questions to determine their level of experience using the Web. Without exception, respondents indicated extensive experience with the

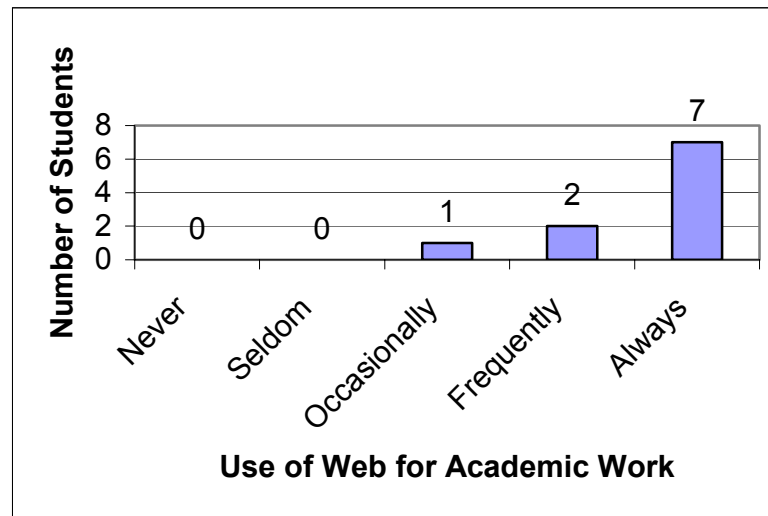
Web, both with respect to the number of years they had used it, and the amount of time they spent looking for information online on a daily basis. The mean number of years of Web use reported was 6.7, with a minimum of four and a maximum of nine. Figure 1 illustrates participants' use of the Web for searching for information on a daily basis. Nine out of ten spend more than ten minutes per day searching the Web, and 40% use the Web over 30 minutes each day.

**Figure 1: Minutes per Day Searching the Web.**

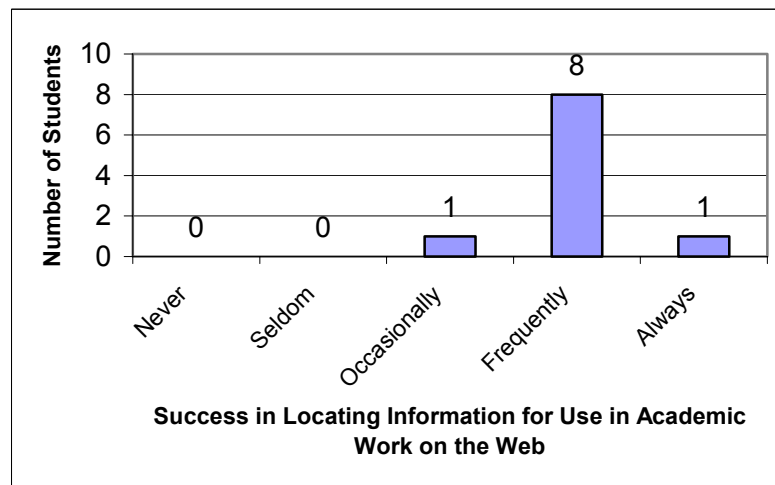


Students' use of Web sources in academic work is well documented and a source of concern to many in higher education (e.g., Davis, 2002). Participants in this study reported extensive use of the Web in their academic work (see Figure 2) as well as high levels of success in locating the information they needed online (see Figure 3). Nine out of ten reported that they frequently or always use the Web for academic research and the same number said they were successful in locating the information they need on the Web.

**Figure 2. When you search for information for use in your academic work, how often do you use the web?**



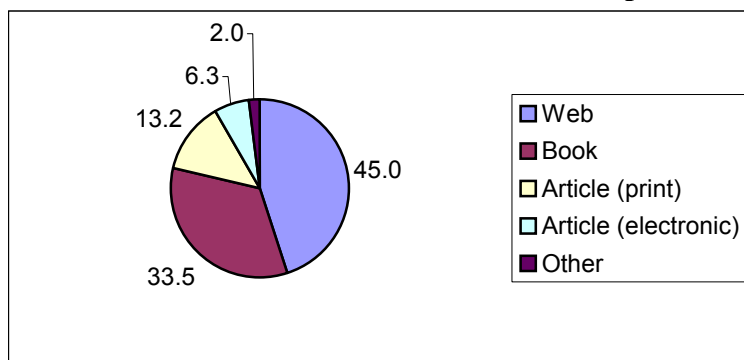
**Figure 3. When you search for information for use in your academic work on the Web, how often are you successful?**



Participants were asked to estimate the percentage of Web information sources they use in their academic work compared to other types of sources (See Figure 4). The mean percentage of Web sources reported was 45, with a minimum of 10 and a maximum of 90. The fact that the average use of journal articles in electronic format used was only 6.3% suggests the possibility that some respondents do not distinguish between articles

retrieved from a subscription database (e.g., EBSCO, Infotrac, etc.) via a browser, and any other Web source.

**Figure 4. Types of Sources Used in Academic Research as a percentage**



Four of the participants indicated they had received some instruction in searching the Web while at UNC-CH. Two students mentioned library instruction classes, one received specialized instruction for an economics course, and one student had taken an information and library science course in information retrieval.

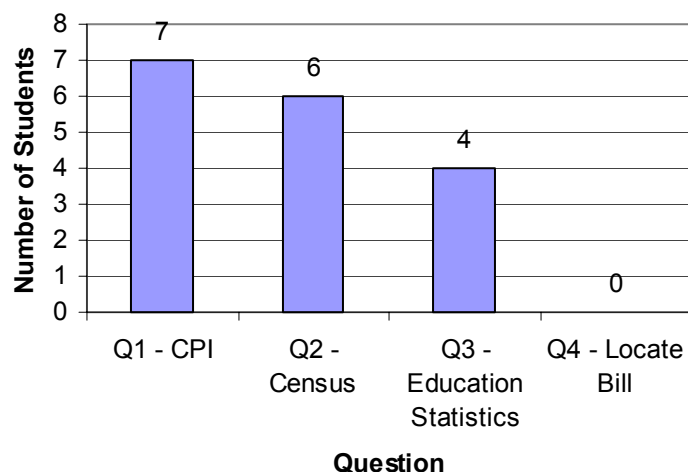
Although it would be an exaggeration to say that the participants in this study “grew up” using the Web, they do appear to have used it throughout their high school and college years, and have integrated it’s use into their daily life and academic work.

### **Web Searching Tasks**

Participants’ success in locating correct answers to test questions varied considerably for each question, and results are presented on a question by question basis below. Overall, the mean number of correct answers per participant was 1.7 out of 4, or 42.5%, with a median of 2. The maximum number of correct answers was three and the minimum was zero. Participants had the most success answering Question 1 involving

the Consumer Price Index, and the least success answering Question 4, locating a Senate bill. Figure 5 shows the frequency of success for each question.

**Figure 5. Frequency of Correct Answers.**



Participants who had received Web searching instruction answered an average of 2.3 questions correctly.

Overwhelmingly, the preferred first move in initiating the search tasks was a Google search. Of the 40 search tasks performed, 35 were initiated with a Google search, four with a Yahoo! search, and one by entering a direct URL. It should be noted that at the time of this study Yahoo! was using the Google search engine. The direct URL was to the Census homepage and the Census was suggested in the question.

The popularity of Google among students at UNC-CH is observed regularly in reference transactions and library instruction classes. When asked to explain their preference for Google, participants offered comments like:

It's just what I've always used. I was told it was best and I find it to be effective.

When I used other search engines, I just feel like Google comes up with the best results. I haven't used other search engines in a really, really long time... I just stick with it.

Significantly, none of the participants used a directory (e.g., Yahoo! or FedStats) to drill down to an appropriate Web site before they began searching, although this approach may have been quite helpful in the complex domain of government information.

A common search problem experienced by participants was a failure to locate what might be called an "entry point" to the information available in a Web site. This could be the homepage, or a search interface that provided efficient access. Librarians and other information professionals know the importance of locating and using specialized and local Web site search engines and search interfaces (e.g., Price, 2001). Such tools are often necessary to access information stored in Web-enabled databases, which are not crawled by spiders. Additionally, domain-specific search fields in an interface, controlled vocabulary, form-based queries, or just well organized homepages can facilitate information retrieval. Additionally, restricting a search to a small subset of the Web can focus results.

However many participants' search strategies seemed designed to "nail" the answer while using Google. (Searching "1997 Major League Baseball antitrust law bill text" instead of "us congress bills", for example.) Frequently the searcher found himself at the correct Web site, but deep within its structure, and unable to efficiently locate needed information.

As expected, participants had the most success with questions whose answers were predictable, and domain knowledge impacted some searches. Another sticking point

in participants searches were the use of date strings in queries.

And although participants report using the Web extensively in their daily lives, they did not often use advanced search techniques while performing the search tasks in this study. Table 2 illustrates the frequency of use of some advanced search techniques:

**Table 2. Searches Employing Advanced Search Techniques**

Search technique	Number of searches n = 39
Google syntax - Quotation marks	3
Google syntax - site:.gov	0
Google Unclesam	0
Browser's "Find" command	3
url shaving	1
Going to 2 <sup>nd</sup> page of results	7

#### **Question 1. Consumer Price Index. (See Appendix B)**

As expected, participants had the most success answering this question, with seven out of ten locating the correct answer. A Google search on "Consumer Price Index" or "CPI" returns the CPI home page from the Bureau of Labor Statistics as the first result. The CPI home page brings a great deal of information about the CPI to the top level of the Web site (see screenshot Appendix F). There are several ways to find the answer to this question including form-based, custom tables. The easiest method is simply to scroll down the page to a link to a historical table. Lack of domain knowledge should not have been too much of a problem as a definition of CPI was provided in the question as well as the concept of a statistical table.

Locating the "entry point" was important in answering this question. Six out of 10 participants located the CPI Home Page and all who did so were successful in finding the

correct answer. Of the four participants who did not visit the CPI home page, only one found the correct answer. Table 3 illustrates the Google/Yahoo! searches employed, and success at locating the appropriate homepage and correct answer. The mean number of search terms for all Google/Yahoo! searches was 3.7. The mean for those participants who located the CPI homepage was 3.6 compared to a mean of 3.9 for those who did not. This pattern of a lower number of search terms associated with locating the appropriate homepage recurs throughout the study.

**Table 3. Question 1**

<b>Participant</b>	<b>Google / Yahoo! Queries</b>	<b>Average # terms/query</b>	<b>Time to Web Site (sec)</b>	<b>Time to Home Page (sec)</b>	<b>Time to Correct Answer (sec)</b>
01	7	4	482		
02	1	2	20	20	162
03	1	3	19	37	172
04	4	3.3			
05	2	4.5	39	39	62
06	2	3.5	92	92	173
07	1	3	26	26	116
08	4	3.5	369	421	473
09	3	3.7			
10	4	3.8	289	289	406
Average	2.9	3.7	167	132	223.4

Working with dates presented a problem to some participants. A seemingly logical Google search on “CPI 1963”, “CPI 1963 - 1969”, or “Consumer Price Index 1963” did not return the CPI Home Page, or any useful Bureau of Labor Statistics page in the first five pages of results. Participants also searched date strings that would not be



likely to exist in indexed documents such as “1963-1969” with no spaces, and “the 1960’s”.

## **Question 2 - 2000 Census (See Appendix B)**

Six out of ten participants found the answer to this question. As expected, the phrase “according to the 2000 Census” made the source of this answer predictable and facilitated searching. Still, it should be noted that only one participant used a direct URL as an opening search strategy. Another participant entered the URL for the Census late in his search after becoming frustrated with Google results. Searches for “census”, “US Census”, “2000 us census” all returned results with the Census Bureau homepage and the Census 2000 Gateway page as top results. The next hurdle for some participants was locating the American FactFinder interface.<sup>2</sup>

This question sought poverty information for the “place” geographic type, in this case the *city* of Raleigh. This information is very difficult to locate by a Web search, and is facilitated by using the American FactFinder interface with its guided query formulation using drop down menus (see screen shot, Appendix G). The Census 2000 Gateway page (see appendix H) offers a variety of options for viewing data and although American FactFinder is the best and most comprehensive, it was often overlooked in favor of “Data Highlights” by state. All six of the participants who eventually located American FactFinder completed the four-step query successfully. Two of the four participants who did not find the answer, reached the Census 2000 Gateway page but did not choose the American FactFinder link.

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<sup>2</sup> The American FactFinder Web site was redesigned in October, 2003, after the completion of data gathering for this study.

Locating the entry point was less difficult for this question due to the predictable source of the answer, however participants who added additional search terms to “2000 Census” experienced problems. For example, Participant #1’s query, “poverty in North Carolina in the 2000 Census” took her to a page within the Census Web site, but she was not able to locate data at the geographic level the question required and she did not find American FactFinder. Table 4 illustrates the Google/Yahoo! searches employed by participants and success at locating the appropriate homepage and correct answer. Again, more search terms meant less success. The mean number of search terms for all Google/Yahoo! searches was 4.4. The mean for those participants who located the American FactFinder homepage was 3.7 compared to a mean of 5.8 for those who did not.

**Table 4. Question 2**

<b>Participant</b>	<b>Google / Yahoo! Queries</b>	<b>Average # terms/query</b>	<b>Time to Web Site (sec)</b>	<b>Time to Home Page (sec)</b>	<b>Time to Correct Answer (sec)</b>
01	2	6	120		
02	1	1	16	379	438
03	1	6	3		
04	2	6.5	42	230	342
05	1	5	41	41	123
06	3	3	23	378	455
07	1	2	18	26	99
08	1	3	21	42	133
09	2	5.5	19		
10	1	6	32		
Average	1.5	4.4	33.5	182.7	265

All participants reached some page within the Census Web site fairly quickly; the average time was 33.5 seconds. But the average time to American FactFinder for the six who found it was slightly over three minutes. Perhaps a prominent link to American FactFinder from every page associated with the 2000 census would improve access. Also, a message on the Census 2000 Gateway page that more clearly indicated the importance of American FactFinder might be useful.

### **Question 3. Education Statistics (See Appendix B)**

Participants experienced a variety of difficulties with this question and only four out of ten found the correct answer. The source of the answer was not predictable from information supplied in the question. The National Center for Education Statistics (NCES) Web site is the key federal resource for locating educational data on the Web. Seven out of nine participants for whom data exist<sup>3</sup> reached some page in the NCES Web site in an average time of 67.1 seconds, but only four located the NCES homepage. A Google search on “US education statistics” or “education statistics” returns NCES as the top result, and even “education” returns NCES on the first page. But most queries included additional concepts from the question, like “1970’s more women universities history US”. Table 5 illustrates the Google/Yahoo! searches employed by participants and success at locating the appropriate homepage and correct answer. The mean number of search terms for all Google/Yahoo! searches was 5.0. The mean for those participants who located the NCES homepage was 4.2 compared to a mean of 5.2 for those who did not.

---

<sup>3</sup> The Camtasia file of participant #1’s search was corrupted. The researcher’s notes recorded initial search strategy and that the participant did not find an answer. Other data was lost.

**Table 5. Question 3 - Education Statistics**

<b>Participant</b>	<b>Google / Yahoo! Queries</b>	<b>Average # terms/query</b>	<b>Time to Web Site (sec)</b>	<b>Time to Home Page (sec)</b>	<b>Time to Correct Answer (sec)</b>
01					
02	2	4	102	102	
03	4	4.8			384
04	5	7.2			
05	1	7	50		189
06	3	2.7	39		
07	1	3	22	22	455
08	1	6	46	126	
09	2	4	155		139
10	1	4	56	74	
Average:	2.2	5.0	67.1	81	291.8

Reaching the NCES homepage, however, did not lead to great success. Only one out of the four participants who performed searches at NCES succeeded in answering the question correctly, and that person found the answer after leaving NCES, on the Census Web site. Lack of domain knowledge was a factor in some searches that were not successful. One participant did not recognize a result from the Digest of Education Statistics that supplied the answer. No participants chose to browse the Digest of Education Statistics or the Condition of Education, two major compendiums of education data that both contained tables with the answer. And there was nothing to suggest to participants that these sources contain anything but current data.

Participants grew frustrated with the NCES Web site and its search interface. Comments like these were typical:

I don't think it should be that hard. It seems like that's fairly simple, the statistic of who's in school, gender wise...I thought that was a pretty general question to have that much trouble finding it.

It kept pulling up the same thing, I'd add in women or I'd add in 1970's it would still pull up 2000-2012 predictions, it would never take into account history.

#### **Question 4. Locating a Senate Bill (See Appendix B)**

None of the participants were successful in locating the bill described by this question. The key resources for locating U.S. federal legislative information online are Thomas (<http://thomas.loc.gov>) and GPO Access (<http://www.gpoaccess.gov>). Finding the text of a bill by searching Google is difficult, as the results of this study show. However, searching either the Congressional Bills Main Page at GPO Access or the Bill Text interface at Thomas, with the query "baseball and antitrust", in the correct year, returns a link to the text of the bill in the first page of results. These search concepts and dates were given in the question and indeed many variations of the search were attempted in Google with no success. So again, a key factor in accessing the needed information is locating the right entry point, in this case the interfaces to GPO's database of legislative information.

The Google queries "US Congress Bills", "US Bills", and "Bills" all return links to GPO Access and Thomas on the first page of results. The query "US Senate Bills" returns a link to GPO Access on the first page but not to Thomas. This last query also returns a link to the U.S. Senate homepage which provides a search interface for bills from the current Congress only. But few participants formulated queries designed to locate an entry point. The larger number of facets or concepts associated with this search task found expression in the majority of the queries. Examples include: "bills signed by

Clinton in 1998” and “senate 1997 major league baseball exemption antitrust law”. Table 6 illustrates the Google/Yahoo! searches employed by participants and success at locating the appropriate homepage and correct answer. The mean number of search terms for all Google/Yahoo! searches was 5.3. The mean for those participants who located the Thomas homepage was 2 compared to a mean of 5.4 for those who did not. No participants located the GPO Access Congressional Bills Main Page.

**Table 6. Question 4 - Senate Bill**

Participant	Google / Yahoo! Queries	Average # terms/query	Time to Web Site (sec)	Time to Home Page (sec)	Time to Correct Answer (sec)
01	3	3.7			
02	1	2	77	145	
03	3	4.3	261		
04	6	6			
05	10	5.9	431		
06	5	5.2	138		
07	1	2	33	33	
08	3	5			
09	5	5.8			
10	8	5.9			
Average:	4.5	5.3	188	89	

Importance of domain knowledge was evident in the searches associated with this question. Our legislative system and its vocabulary are complex and can be confusing. One participant spent most of his session following links to Senate *hearings* about baseball and antitrust law, rather than searching for bills. Another pursued House bills rather than Senate bills. Others browsed state government Web sites, and the Web sites of the Department of State and the Whitehouse.

The performance of the Thomas search interface was also a factor in participants' success. The Bill Text page and Bill Summary page (see Appendix I) default to the current, 108<sup>th</sup> Congress. Although this information is displayed at the top of each page, along with the invitation to select a different Congress, both participants who actually found Thomas ignored this crucial step, and spent all their time on the site searching in the wrong date range. On each page, the Congress selection seems almost a part of the Webpage banner, and consists of simple links, whereas the rest of the search interface is made up of text boxes, and pull-down menus. A pull-down menu that forced a date decision would likely improve performance. Both participants eventually became frustrated with Thomas and left the site to search elsewhere.

## SUMMARY AND CONCLUSION

This study has several limitations. Only ten participants took part in this study. A sample of this size is not representative of the undergraduate population of UNC-CH. A second limitation relates to the content validity of the test questions. A handful of questions cannot represent a full definition of the government information needed by undergraduates in their course work. Developing the questions with the assistance of reference and instruction librarians helps to insure that the questions are based on past experience and that the information is frequently used, but the issue of content validity cannot be completely resolved.

Although this study has limitations it yielded interesting results. Observing how people actually search for government information and assessing their success provides an additional perspective to studies of self-reported behavior. The students who participated in this study were very experienced Web users, who have integrated the use of the Web into their daily lives and academic work. Participants answered an average of 1.7 out of four, or 42.5% of the questions in this study correctly. They had much greater success with predictable source questions than with unpredictable source questions.

Of the 40 search tasks performed, 35 were initiated with a Google search, four with a Yahoo! search, and one by entering a direct URL. No participant used a directory, such as Yahoo!, to drill down to an appropriate Web site before searching.

Lack of domain knowledge of government information was a sticking point for some participants, as was working with dates, both within Web site search interfaces and with Google. Another common search problem was locating an “entry point” or key search interface to the information contained within a Web site. Many participants



submitted Google queries with a large number of search terms representing the multiple concepts of the question. Results from these queries often led to the correct government Web site, but to a location deep within its structure, where efficient searching was difficult.

No participants located or used Fedstats, the gateway to government statistical information. No participant located the Congressional Bills Main Page at GPO Access; only two participants located Thomas, and four located the homepage of NCES. This is disconcerting given the resources committed to developing and maintaining these sites, and their utility. In October of this year GPO announced that it had completed a three month test of paying for positioning on Google (GPO, 2003). Results from the present study suggest that paid positioning may be an excellent strategy for bringing government information to a wider audience. Overwhelmingly, participants chose searching with Google as their preferred strategy for locating government information on the Web. And yet their queries often failed to take them to a key search interface. A prominent *advertisement* for Thomas or GPO Access that encouraged searchers to “Begin your search for legislative information here,” would likely have assisted the participants in this study. However, locating the appropriate search interface is of little value if users find it confusing. Better interface design is part of the answer and could benefit Thomas and NCES.

Results of this study suggest that although undergraduates are very experienced Web users, they may not be expert Web searchers. Instruction librarians may need to devote more resources to Web searching instruction, particularly to emphasizing the importance of Web site-specific search engines, and strategies for locating them.

Librarians create and continuously update online guides to key Web resources in their subject areas -- precisely the kinds of Web sites students need for their academic work (see e.g., Van Fossen, 2003, [http://www.lib.unc.edu/reference/quick/index.php?display=print\\_items&item\\_id=141](http://www.lib.unc.edu/reference/quick/index.php?display=print_items&item_id=141))

Participants in this study may have benefited from knowledge of these guides.

Results of this study indicate that undergraduates will continue to require some kind of assistance in locating the government information they need. Government information is complex, comes in many formats, and is distributed among many entities and locations. The fact that it is available on the Web does not automatically make it accessible to those seeking it.

## **ACKNOWLEDGEMENTS**

NSF Grant # EIA 0131824 provided financial support for this user study.

Many thanks to Gary Marchionini, Lisa Norberg, and Ridley Kessler for their advice, insights, and encouragement.

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## **Appendix A**

### **Recruitment Email Message**

Take part in a UNC graduate student's research project on searching the World Wide Web, and earn \$20 for approximately one hour of your time.

You have been selected randomly from UNC-Chapel Hill undergraduates to participate in a research study exploring students' success in searching for information on the Web, for use in their academic work.

If you participate in this study you will be asked to conduct searches on the Web to find the answers to 4-5 predetermined questions. The session will take place in the School of Information and Library Science Interaction Design Lab. Your search processes will be recorded for later analysis, but no identifying information about you will be included. You will also be asked to answer questions about your use of the Web and about your experience during the search process. The session should take approximately 1 hour and you will receive \$20 as compensation for your effort.

This study has been approved by the UNC-CH Academic Affairs Institutional Review Board. If you have any questions about this project please contact James Ovitt at [ovitj@email.unc.edu](mailto:ovitj@email.unc.edu), or Dr. Gary Marchionini at [march@ils.unc.edu](mailto:march@ils.unc.edu).

If you would like to participate in this project, please respond to this message to arrange a session time.

Thank you for supporting educational research.

James Ovitt - Graduate Student  
School of Information and Library Science  
University of North Carolina at Chapel Hill  
[ovitj@email.unc.edu](mailto:ovitj@email.unc.edu)

## **Appendix B**

### **Search Questions**

#### Search Question #1.

The Consumer Price Index (CPI) is a measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services. You are interested in price changes during the 60's, particularly during the years of Johnson's presidency. Locate a table that provides the CPI for the years 1963 -1969.

#### Search Question #2.

According to the 2000 census, how many families living in Raleigh, North Carolina were below the poverty level in 1999?

#### Search Question #3

Sometime during the 1970's, for the first time, more women than men were enrolled as undergraduates in degree granting institutions of higher learning. In what year did this happen? Have men ever caught up since?

#### Search Question 4.

In 1997 a bill was introduced in the Senate that sought to limit Major League Baseball's exemption from antitrust law. Approved by Congress, and signed by Clinton in 1998, the new law granted players the same rights and protections as professional athletes in other sports. Find the text of the bill and the name of the bill's sponsor in the Senate.



## **Appendix C Informed Consent Form**



THE UNIVERSITY OF NORTH CAROLINA  
AT  
CHAPEL HILL

School of Information and Library Science  
Phone# (919) 962-8366  
Fax# (919) 962-8071

CB# 3360 100 Manning Hall  
Chapel Hill NC 27599-3360  
Email: [info@ils.unc.edu](mailto:info@ils.unc.edu)  
[Http://www.ils.unc.edu](http://www.ils.unc.edu)

### **Undergraduate Students' Success in Searching for U.S. Government Information on the Web.**

#### **Introduction to the Study:**

You are invited to participate in a study of undergraduate students' success in searching for U.S. government information on the World Wide Web. This study is being conducted as part of a master's paper for the M.S. in Library Science degree, by James Ovitt (962-5328, [ovittj@email.unc.edu](mailto:ovittj@email.unc.edu)).

#### **Purpose:**

The purpose of this study is to determine the extent to which undergraduate students are successful in locating government information for use in their academic work using the Web, and to examine the search strategies they employ, and the problems they encounter. Results of this study will assist librarians in designing instruction classes and guides.

#### **What Will Happen During the Study:**

You will be asked to complete a brief questionnaire about your use of the Web for academic work and other purposes. You will be asked to locate documents and supply answers to four questions requiring U.S. government information, by searching the Web. Finally you will be asked a series of questions about the search tasks you performed. The search tasks you perform will be recorded using videotape and keylogging software. The tapes and logs will not identify you in any way. The searches, questionnaire and interview can be completed in approximately one hour. After completing the study activities you will be offered \$20 in appreciation for your participation.

#### **Your Privacy is Important:**

Every effort will be made to protect your privacy.

Your name will not be used in any of the information created in this study or in any of the research reports.

The logs and recordings of your Web searches will not contain any information that can identify you.

**Risks and Discomforts:**

The investigator does not know of any personal risk or discomfort you will have from being in this study.

**Your Rights:**

You decide on your own whether or not you want to be in this study.

If you decide to be in the study, you will have the right to stop being in the study at any time.

**Institutional Review Board Approval:**

The Academic Affairs Institutional Review Board (AA-IRB) of the University of North Carolina at Chapel Hill has approved this study. If you have any concerns about your rights in this study you may contact the Chair of the AA-IRB, Barbara Davis Goldman, Ph.D., at [aa-irb@unc.edu](mailto:aa-irb@unc.edu).

**Your Consent:**

I have had the chance to ask any questions I have about this study, and they have been answered for me. There are two copies of this form. I will keep one copy and return the other to the investigator.

I have read the information in this consent form, and I agree to be in the study.

---

(Signature of Participant)

---

(Date)

### Appendix D Pre-Test Questionnaire

1. What is your age? \_\_\_\_\_
2. What is your sex? \_\_\_\_\_Female \_\_\_\_\_Male
3. Which term best describes your academic status?  
       \_\_\_\_Freshman \_\_\_\_Sophomore \_\_\_\_Junior \_\_\_\_Senior
4. What is your major or intended major? (Write “undecided” if unsure.)  
       \_\_\_\_\_
5. How long have used the Web for searching for information?  
       \_\_\_\_Years               \_\_\_\_Months
6. On average, how many minutes per day do you spend looking for information of any kind on the Web?  
       \_\_\_\_Less than 5 \_\_\_\_5 - 10 \_\_\_\_11-20 \_\_\_\_21- 30 \_\_\_\_More than 30
7. Have you received any instruction in searching the Web while at UNC-CH?  
       \_\_\_\_Yes      \_\_\_\_No  
       If yes please describe:
8. When you search for information for use in your academic work (for example, in your papers, presentations, speeches, projects), how often do you use the Web?  
       \_\_Never      \_\_Seldom      \_\_Occasionally \_\_Frequently \_\_Always
9. On average, when searching for information for use in academic work on the Web, how often are you successful in locating the information that you need?  
       \_\_Never      \_\_Seldom      \_\_Occasionally      \_\_Frequently \_\_Always

10. On average, when you engage in research for your academic work, what percentage of the sources you use are:

Web sources \_\_\_\_\_

Books \_\_\_\_\_

Journal articles in print format \_\_\_\_\_

Journal articles in Electronic format (full text) \_\_\_\_\_

Other \_\_\_\_\_

11. Have you previously sought information from U.S. government sources for use in your academic work? \_\_\_\_\_ Yes \_\_\_\_\_ No

If yes please describe:

## Appendix E

### Post-test Interview Questions

#### Post-Test Interview

Session Number \_\_\_\_\_.

For each search task:

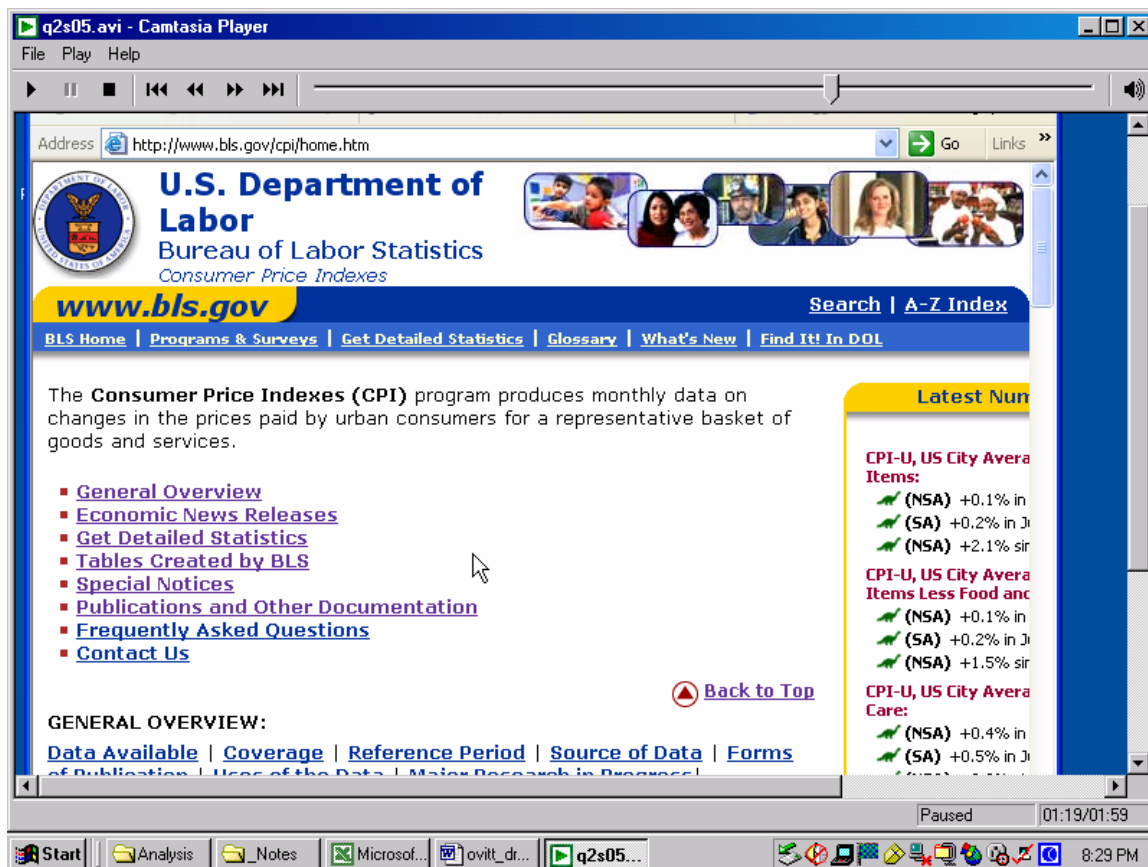
1. How would you rate the difficulty of this question?  
1 to 5, where 5 is most difficult \_\_\_\_\_.
2. Describe your search strategy for this question.
3. Why did you take this approach?
4. What aspects of the question made finding the answer difficult?
5. What problems did you encounter in your search?
6. If applicable, what aspects of the question made finding the answer easy?

If applicable (ie. if the participant utilized the highlighted Web site):

7. What did you think of the **GPO Access** Web site? Was it difficult to use? What problems did you have with it? What would make it easier to use?
8. What did you think of the **Thomas** Web site? Was it difficult to use? What problems did you have with it? What would make it easier to use?
9. What did you think of the **Census** Web site? Was it difficult to use? What problems did you have with it? What would make it easier to use?
10. What did you think of the **Consumer Price Index/Bureau of Labor Statistics** Web site? Was it difficult to use? What problems did you have with it? What would make it easier to use?
11. What did you think of the **National Center for Education Statistics** Web site? Was it difficult to use? What problems did you have with it? What would make it easier to use?
12. If you needed to find the kinds of information you looked for today for a real project how would you proceed?

## Appendix F

### Screen Shot of Consumer Price Index Home Page



## Appendix G

### American FactFinder Screen Shot

q1s07.avi - Camtasia Player

File Play Help

American FactFinder - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media Print Mail W Yellow Person

Address [http://factfinder.census.gov/servlet/BasicFactsServlet?\\_basicfacts=1&\\_mult1=8626225&\\_geo2=160&\\_geoType1=91910128&\\_current=1&\\_acti](http://factfinder.census.gov/servlet/BasicFactsServlet?_basicfacts=1&_mult1=8626225&_geo2=160&_geoType1=91910128&_current=1&_acti)

**U.S. Census Bureau** **American FactFinder**

[Main](#) | [Search](#) | [Feedback](#) | [FAQs](#) | [Glossary](#) | [Help](#)

**!** American FactFinder will be unavailable from 8pm until 11pm Thursday, September 11th for system maintenance. All times are Eastern Daylight Time. We apologize for any inconvenience.

**Search**

☒ keyword  
☐ geography

-- or --

**Enter a street address**  
 to find Census 2000 data

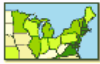
**What's New**

- Improvements to American FactFinder Now Available
- 2002 American Community Survey Data Available for All States
- 2000 Population Estimates

**Basic Facts** Popular tables and maps for the U.S., states, counties, cities, towns, and American Indian reservations

☒ Tables 

Table	Population	Income
Under 1 year	45,402	3,754
1 and 2 years	101,738	21,444
3 and 4 years	105,138	21,942
5 years	48,213	11,844
6 years	12,021	11,844

☐ Maps 

**Show me** Economic Characteristics: Employment, Income, Poverty and more

**for** a City or Town

North Carolina Raleigh city

**Data Sets** All tables and maps for all geographies including the U.S., states, counties, cities, towns, American Indian reservations, metropolitan

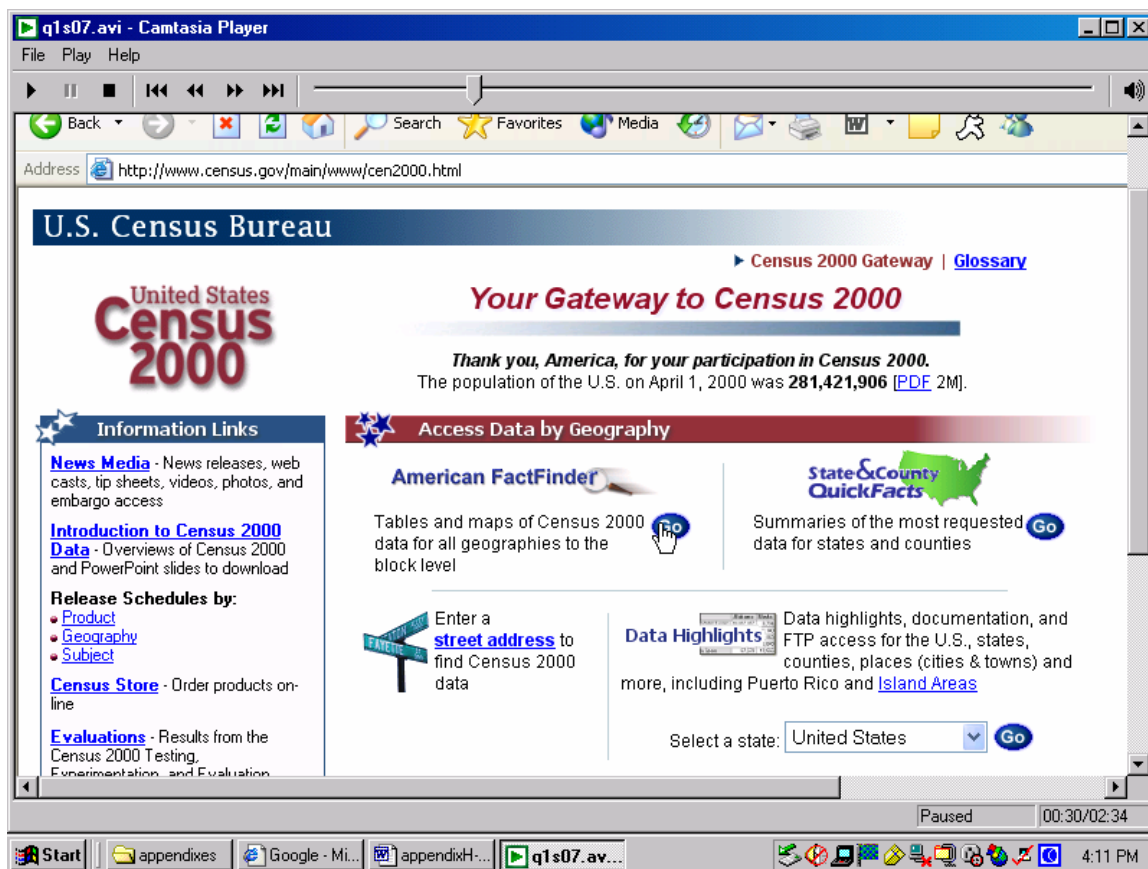
Paused 01:12/02:34

Start appendi... IRB Pro... Google ... appendi... q1s07... 4:04 PM

## Appendix H

### Census 2000 Gateway Page

### Screen Shot





## Appendix I

### Thomas Bill Text Search Page

#### Screen Shot

