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1.0 Abstract & Proposal

“The Internet Archive is a public nonprofit that was founded to build an ‘Internet library,’ with the purpose of offering permanent access for researchers, historians, and scholars to historical collections that exist in digital format.”¹ The Internet Archive is a comprehensive web-based digital library that continually crawls and archives all public Internet pages. This archived material (web sites) is accessed through various search services. In this paper we focus on one specific search service - the Wayback Machine. As the name suggests, the ‘Wayback Machine’, aids the user to “surf the web as it was.”²

The mission of our project is to help the Internet Archive (http://www.archive.org) and specifically the Wayback Machine, understand the requirements of their growing user base. We identify users of the Wayback Machine, present our studies of user experience and behavior, and finally make recommendations to enhance the user's experience with the Wayback Machine.

Heuristic and qualitative analysis techniques were employed to discern usage patterns. Our analysis revealed that the users of the Wayback Machine find its features and functionality intuitive and easy-to-use. We also found that there exists a certain population of ‘expert users’. This user-segment is looking to access specific information on particular topics during a given time-period from the Internet Archive’s collections. While performing this study, we realized that this is just a beginning. This paper provides an exhaustive list of first-phase recommendations for the Internet Archive to meet the demands of its growing user population.

¹ Source: http://www.archive.org/about/index.html
² Source: http://www.archive.org/index.html
2.0 Background

2.1 Executive Summary

As described above, the Internet Archive (IA) is a comprehensive web-based digital library that continually crawls and archives all public internet pages, which are then publicly accessible through the Wayback Machine search service. Some of the common principles revealed about digital archives are also defining motivations for IA while others are important underlying differences. The project team recognized a need to identify, understand and satisfy the requirements of the Internet Archive’s growing user base. Improvements in the archives usefulness and benefit to its users could then be extracted to maximize the collective benefit. A qualitative data-gathering process was implemented and the results of this process resulted in a list of recommendations that provide a platform for future work related to this information service. We feel that addressing these concerns will enhance the user's experience with the Wayback Machine.

2.2 Research Team

The research team for this project consisted of three graduate students — Pallavi Aravind, Vanessa Arce, and Peter Roessler — of the School of Information Management and Systems at the University of California, Berkeley. This research was carried out under the direction of Professor Peter Lyman, whose focus is on the ethnographic study of communication and social formation in digital and networked environments.

2.3 Introduction to Digital Archives

The role of archives has traditionally been for the preservation of cultural heritage through artifacts (i.e. libraries (focused on books and allied media), and museums (focused on carefully selected textual documents, graphical objects like paintings, and structures like sculpture)). A binding characteristic of these artifacts is that they “move through life cycles. They are created, edited, described and indexed, disseminated, acquired, used, annotated, revised, re-created, modified and retained for future use or destroyed by a complex, interwoven community of creators and other owners, disseminators, value-added services, and institutional and individual users.” Without some form of static repository, these and other factors clearly limit what can be understood, at least from an anthropological perspective, about the cultural context of the archive in question. It is clear that society then “has a vital interest in preserving materials that document issues, concerns, ideas, discourse and events” within such contexts.

A digital archive, then, also preserves cultural and historical information— artifacts in digital formats— and similarly unites “communit[ies] of actors in their various
information-based activities [and] their common purpose. Today, for example, we rely
on digital archives to “track our genealogies, to understand what science has
discovered, to appreciate the stories people told a hundred years ago, and to know how
we educated our children during the Depression.” The value-add provided by digital
archives generally reflects its “individual purpose, … tailored to the necessities of
different user groups.” In addition to aggregating resources for a specific purpose,
digital archiving also provides a way to alleviate the common problem of accessibility,
the locating of relevant items, in large collections. Digital archives therefore serve the
same humanistic functions as traditional archives while their technical characteristics
provide a novel way for a user to access the information contained within it.

In order to corroborate these traits, we felt it was necessary to conduct a broad survey
of existing digital archives. The survey primarily looked for commonalities reflecting
the motivation, the reasons, for aggregating their components. We reasoned that the
patterns may or may not be obvious, but that careful thought on a representative
sampling should suffice for our purposes. We performed some simple searches on
popular Web search engines for our sample. At first glance, every major digital archive
we explored maintained, without exception, some content specificity. Representative
examples were as follows:

- NASA’s digital image collection
- The Digital National Security Archive—the most comprehensive digital collection
  of declassified primary documents defining U.S. government policy
- USGenWeb Project—offers transcriptions of public domain records for
genealogical research
- Swiziland Digital Archive focuses on the country’s historical photographs
- Japanese American Relocation Digital Archives (JARDA)—a "thematic
  collection" documenting the experience of Japanese Americans in World War II
  internment camps
- UCSF Tobacco Control Archives—provides papers, unpublished documents and
electronic resources relevant to tobacco control
- The Pandora Archive of the National Library of Australia

It seemed each archive was created purposefully to support specific tasks and in many
cases provide topic-focused content to their audience, “rubrics for coordinating a user’s
group of common activities”. They had specific users in mind, who all had closely
related possible usage scenarios to satisfy their needs. This has been called an ‘actor-

3 http://www.rlg.org/ArchTF/tfadi.index.htm
4 http://www.scope.gmd.de/info/www6/posters/743/743.html
3 http://images.jsc.nasa.gov/
4 http://nsarchive.chadwyck.com/
5 http://www.rootsweb.com/~usgenweb/
6 http://www.sntc.org.sz/sdphotos/
7 http://jarda.cdlib.org/
8 http://www.library.ucsf.edu/tobacco/
network’ scenario, “linking people and things in the environment.” There was an implicit principle of historic preservation illustrated in each example. All were deliberate collections of specialized digital artifacts created to ensure their availability.

2.4 Introduction to Internet Archive

It seems most appropriate to begin describing the motivation for the Internet Archive, the Wayback Machine service, and ultimately the subsequent research described here, by presenting the statement offered up by the service itself.

“The Internet Archive Wayback Machine is a service that allows people to visit archived versions of stored Web sites. Visitors to the Wayback Machine can type in a URL, select a date range, and then begin surfing on an archived version of the Web. Imagine surfing circa 1999 and looking at all the Y2K hype, or revisiting an older copy of your favorite Web site. The Internet Archive Wayback Machine can make all of this possible.”

As straightforward as this statement might seem, it precludes many curiosities about what the Archive actually is. The Web, we know, is the largest document ever written and “ninety-five percent of Web pages are publicly-accessible.”

This makes this Internet Archive absolutely unique in content and scope. One might wonder how a comprehensive archive such as this is possible or, more importantly, what the motivations behind such an endeavor might be in the first place, in order to better understand its utility. We learned that this “Internet equivalent of the Library of Congress has been capturing and archiving every public Web page since 1996” and that there are certainly two clearly stated motivations. That of its use for documenting the provenance of the Internet, as “a historical record of cyberspace… [and] as part of an innovative search tool that lets users call up “out-of-print” Web pages.” This is coupled with grander plans to then “make [the Archive] part of the infrastructure of the Internet.”

Given this high-level context and purpose, there naturally seems to be more to the story of the Archive under the surface. A collection and service of this magnitude couldn’t possibly be summed up within the text of a few sentences. These motivations described here are certainly plausible ones, even noble. Yet, one is left to wonder about what the Archive is actually making possible. One knows now that they can go back and look at an old version of a Web site, but one might wonder, as we at the School of Information Management and Systems did, if that is realistically the Wayback Machine’s sole use, or if there are also unexplored, undocumented, or unrealized uses beyond what is touted.

The sheer scope of this digital collection incites many new questions. What exactly has been archived in the public domain? Is everything that was ever out there really available to view? What is the ultimate purpose for collecting all of this information?

12 http://dream.sims.berkeley.edu/wayback/biblio/lymanWHY.pdf
13 http://sfgate.com/cgi-bin/article.cgi?file=/chronicle/archive/1998/05/07/BU3256.DTL
Who is using this on a regular basis? Why? What for? Before we could determine the Archive’s relevance and usefulness to anyone (or at least to better define it) and focus the scope of our research pursuits, we felt it was imperative to critique the Archive in terms of what we learned about other digital collections. It seemed an ambitious and misdirected task to assess any of the described motivations without taking a look at similar digital archives.

Given that archives serve as historical artifacts within the context of a specific topic, we recognized that despite the unprecedented scale in collection size, the Internet Archive had no specific topic of focus to speak of. One could say that the Archive uniquely attempts to capture all possible topics at once. Should the focus for this unique archive be, then, simply to continue to preserve valuable social and cultural artifacts, to provide a variety of topic-specific content for academic, research or other purposes like other digital archives, or is it intended to be all-encompassing? There is also the possibility of future benefits, not yet known, that would result from its usefulness in conjunction with technological innovation or some future social context.

2.5 Initial Evaluation by Research Team

We therefore observed, to a large extent, examples of digital archives that collectively encompassed many varied topics and that were each content-centric. The implicit motivations behind many of them were quite similar to what has been stated about the Archive. Yet, all were also largely defined by their specialized contents, a characteristic missing from the Internet Archive. What we were seeing was a major diversion from the common threads of most other digital archives. Here is a vast collection mirroring the Internet itself across time, something wholly unique. If any user of any of the other archives would, by default, be engaged in some specific interest or need for them to use it in the first place, then what of the users of this ‘Wayback Machine’? Perhaps there are some useful general trends to extract about its use that just aren’t so obvious, as is otherwise the case.

Perhaps less obvious was how we might juxtapose the idea of a ‘users with a common purpose’ from the survey with any user of the Internet Archive. The literature makes the point that concerning archiving, “the intellectual integrity of [the artifacts of the archives] is maintained and [the] individual [artifacts] are always contextualized.” It was obvious that this assumed contextualization was uniquely missing from the Internet Archive altogether as it encompassed a number of possible categories for its terabytes of Web pages and associated metadata. We then wondered what the most common contexts might be for current users of the Archive and the myriad ways their needs are possibly overlooked. Due to the breadth of the collection itself, we thought some sort of user study would have to be carried out to define any ‘users with a common purpose’. Work needed to be done to collect the missing user information that is normally obvious with respect to other digital collections.

14 http://www.jisc.ac.uk/dner/preservation/richtext/digital-seminarrepdg.htm
We wanted to map out a process for identifying these user communities in order to look at the tool and whether or not it supports those user communities and their usage patterns. Gilliland-Swatland commented on this approach, stating that “it is important to understand the societal roles of archives because it is in the fulfillment of these roles that archivists provide the necessary skills and knowledge to contribute to the [current] paradigm.” Might we identify and define ways, beyond what is described here at the surface, in which the Archive could be better utilized? Are there demands for potential use that are not currently satisfied? Would we be improving the current and future usefulness of such a unique information service if we address its pitfalls and potential alike with a user-centered approach?

We, therefore, made some initial decisions about the necessity of qualitative data collection. This was grounded in our recognition not only of the inherent qualities of other existing digital archives but also of our resulting suspicion that there must then exist some common threads worth documenting among the total population of users. It seemed logical to carry out some foundation research here for future related projects and for larger-scale user population sampling and data collection in order to support our findings.

15 http://mcel.pacificu.edu/JAHC/JAHCI13/P-REVIEWS/holcomb.html
3.0 Research Design & Artifacts

Project Plan
We devised a group plan and methods for evaluating the Internet Archive and the Wayback Machine. We relied upon our understanding of, and experience with, formal methodologies. The project phases, approaches and resulting artifacts are provided below:

<table>
<thead>
<tr>
<th>Phase</th>
<th>Approach</th>
<th>Artifact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Assessment</td>
<td>Meet with Brewster Kahle and assess goals and objectives of project.</td>
<td>Business Proposal</td>
</tr>
<tr>
<td>Industry Research</td>
<td>Evaluate archives, use, design, and overall value.</td>
<td>Research References</td>
</tr>
<tr>
<td>Heuristic Inspection</td>
<td>Group heuristic evaluation and inspection of Wayback Machine.</td>
<td>Heuristic Recommendations</td>
</tr>
<tr>
<td>User Testing</td>
<td>Conduct usability tests with task-oriented operations and questionnaire.</td>
<td>Pre and Post Questionnaire, Task Sheet, Coded Results</td>
</tr>
<tr>
<td>Phone Interviews</td>
<td>Formal and anonymous phone interviews with active users of the Archive.</td>
<td>Interview Questions, Coded Results</td>
</tr>
<tr>
<td>Final Analysis</td>
<td>Analyze data, compile and evaluate results, prepare report.</td>
<td>Final Report</td>
</tr>
</tbody>
</table>

Method
The project plan was formed after meeting with the founder, Brewster Kahle. We submitted the business proposal, gathered information regarding archives, and proceeded to formulate our priorities and the company’s understanding of their users. The most specific data on users and usability was to be acquired during the user testing and phone interviews.

3.1 Initial Assessment

Plan
Our group approached the Archive with the understanding that there were a variety of approaches to making recommendations about the uses and applications. However, our central concern was meeting a foundation of desires presented by Brewster Kahle, Founder and Director of the Internet Archive. The initial assessment phase allowed us to verbalize the goals of the project and begin understanding the project on a broader scale as it pertained to the Founder.

Methodology
Our initial meetings were pre-arranged and were scheduled within a week of each other. This was our discovery phase and we wanted to make sure that we were gathering information as accurately and also as quickly as possible. Our first meeting developed the scenario and we visited the Archive for a better feel for the work at hand. The next meeting was also at the Archive and the participants included the entire staff of the Archive and Alexa. This meeting introduced us to the larger group involved in the operations of the Archive. We also were able to meet the people who would later facilitate our research. Within a week of this meeting, we submitted a business proposal to Brewster and received confirmation of the scope and breadth of our work.

3.2 Industry Research

Plan
We decided background research was necessary for us to approach this project. Our plan was to specifically look at the history of digital archives, and their importance to the culture and education of a population. Brewster Kahle and the Internet Archive share the vision of most archives – a vision to present information in a non-biased format that allows the user to derive value directly from the information. Our archive research was valuable in assessing the viability of our project and in determining the larger picture of an information resource that provides objective history.

Methodology
Our research was exhaustive and methodic. We culminated articles, books and interviews with archive professionals. We disseminated the results in our weekly group meetings and began to outline a value-based approach to the direction of the project. All research references are included in the appendix.

3.3 Heuristic Inspection

Plan
The plan for our heuristic inspection component was to gather information about our educated impressions of the archive before we began the field research into the user experience. Our group strengths varied in emphasis, our experiences were different enough to allow a multiple-discipline approach to evaluating the as-is interface and usability. The heuristic inspection was informal but well documented and would form the basis for our initial design of the user tasks and questionnaires.

Methodology
Each of the three evaluators walked through the site separately noting concern areas. The evaluators then met to compare and compile their lists of heuristics, combining areas and agreeing on rating levels for concern areas.

Participants: The evaluators were the three project team members.

Heuristics used: Jacob Nielsen’s revised list of 10 guidelines. The guidelines can be found at this URL: http://www.useit.com/papers/heuristic/heuristic_list.html
3.4 User Testing

Plan
The user testing would allow us to view users in performing typical tasks associated with the Wayback Machine in real-time. Our tests were purposely designed to be clear and direct in purpose and they consisted of, on average, 4 tasks. They were also open-ended to user input.

User Test Subject Selection
We conducted a series of formal planned tests. Our users were selected based on the following criteria:

- Familiarity with and knowledge of online search systems
- Usage of the Internet and other digital archives/libraries for research
- Knowledge of, and opinions about, user-friendly design and interfaces

Our user group consisted of graduate students from the School of Information Management and Systems (SIMS). SIMS students would likely have experience with electronic search, and would comment on the user interface and layout. The tests were conducted in the school lab and were administered by our project group.

Methodology
The User Test was developed to assess the current usability of the as-is archive and to identify immediate usability problems as well as potential recommendations for future design considerations. Users were tested one at a time on a sequential series of tasks. Typically, one monitor was present to oversee the test and record written, verbal, and observed user actions. Since the test was more of an information-gathering tool versus an exploratory assessment, monitors minimized their interactions with users and concentrated on observed behaviors rather than individual thought processes. The monitors were looking to observe the following kinds of information:

- User’s initial impressions of the Internet Archive
- User interactions with the Internet Archive and Wayback Machine
- Learning curve to use the system
- Success/Failure to learn how to use the system

User Questionnaire

Plan
The questionnaire would accompany the tasks and we designed it to give us a basic understanding of the user and their level of experience. It would serve as a statistical component and also give us insight into the user perspective, but would remain anonymous.

Methodology
The user questionnaire was divided into two parts, pre-task and post-task. It was administered to the user prior to testing and then after testing. It included questions that
gathered historical information about each user's experience with search systems. These questions were designed to elicit the following kinds of information:

- Confirmation as to whether a user was appropriate for the test.
- Prior knowledge of search systems.
- Verification of assumptions made about user group definitions and characteristics.
- User opinions about the value of the search service.

### 3.5 Phone Interviews

#### Plan
Our initial understanding of Internet Archive user groups came from our discussions with the founder. These came in turn from feedback from users to the Archive. The phone interviews would allow us to gather opinions of these real-time users who had interacted with the Internet Archive and provided feedback. Our interview was designed to be clear and direct in purpose and they consisted of, on average, 4 tasks. They were also open-ended to user input.

#### Subject Selection
The interviewees were randomly selected from the database of users who had contacted the Internet Archive. Each monitor conducted one-on-one interviews with the users.

#### Interview Methodology
The interview was administered on the telephone at a determined convenient time frame. The interview questions were designed to elicit the following kinds of information:

- An understanding of the typical Archive user.
- Further verification of our ideas about user group definitions and characteristics.
- A background description of the user's first exposure to the Archive.
- A description of the how the user interacted with the Archive
- User opinions about the value of the Wayback Machine.
- Suggestions about improving the capabilities of the Wayback Machine.

### 3.6 Final Analysis

#### Plan
After analyzing, compiling and evaluating the results from our data sources, we will produce a final report which will be presented to Brewster Kahle.

#### Methodology
The report will be written in traditional format with all findings and supportive documentation provided.
4.0 Research Findings

User Tasks
Refer to Appendix for User Test Artifact. Users were given four tasks to complete using the system. Users succeeded with no error in Task 1. Four out of five users completed Task 2, and three out of six users completed Task 3, and four out of six completed Task 4.

Task 1: Use any browser to locate Internet Archive at www.archive.org.
Task 2: Run a search on Wayback Machine for www.berkeley.edu
Task 3: Search for and locate a personal website.
Task 4: Search for a popular news site.

<table>
<thead>
<tr>
<th></th>
<th>User 1</th>
<th>User 2</th>
<th>User 3</th>
<th>User 4</th>
<th>User 5</th>
<th>User 6</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 1</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>100%</td>
</tr>
<tr>
<td>Task 2</td>
<td>P</td>
<td>S</td>
<td>S</td>
<td>P</td>
<td>S</td>
<td>S</td>
<td>83%</td>
</tr>
<tr>
<td>Task 3</td>
<td>S</td>
<td>P</td>
<td>U</td>
<td>S</td>
<td>S</td>
<td>U</td>
<td>58%</td>
</tr>
<tr>
<td>Task 4</td>
<td>S</td>
<td>P</td>
<td>S</td>
<td>P</td>
<td>S</td>
<td>S</td>
<td>83%</td>
</tr>
<tr>
<td>Total</td>
<td>88%</td>
<td>75%</td>
<td>75%</td>
<td>75%</td>
<td>100%</td>
<td>75%</td>
<td>81%</td>
</tr>
</tbody>
</table>

Key: S=Successful (2 points), P=Partially successful (1 point), U=Unsuccessful (0 points). Total points available: 12 per task.

User Test Findings by Task

Key:
U1: User 1
U2: User 2
U3: User 3
U4: User 4
U5: User 5
U6: User 6
Q: Quote
C: Comment
O: Observed
X: Problem or Potential Problem
S: Successful Step
AN: Additional Notes

Also See Appendix for Field Notes.
<table>
<thead>
<tr>
<th>Task 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Task and Completion Criteria</strong></td>
</tr>
<tr>
<td><strong>Task:</strong> Use any browser to locate Internet Archive at <a href="http://www.archive.org">www.archive.org</a></td>
</tr>
</tbody>
</table>
| **Completion Criteria:** User locates Archive. | U3:1.C  
U4:1.Q, 5.O  
U5: 3.0  
U6: 1.Q, 2.C |
| 2. Information architecture unclear. Collection incomplete. Suggests rearrange of information architecture. Likes movie and election topics. Description paragraph is confusing for laying out purpose of Archive. Looks professional. Likes statistics table, wants in another more prominent place. Collection like September 11 and election are helpful. Notices special collections area. System weak and unclear with respect to user. “Sidebar has no use, I ignore it.” Focus on Wayback right away, wants to click on it. | U1:1.Q  
U3: 3.0  
U6: 2.C, 3.O |
| 3. I would like to see category search. “What does take me back mean?” Paragraph is confusing for describing purpose. I would like to see a more sophisticated search option. | U3: 4.C,  
U4: 4.Q,  
U5: 7.Q,  
U6: 2.C, 4.Q |
## Task 2

<table>
<thead>
<tr>
<th>Task and Completion Criteria</th>
<th>Observed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Task:</strong> Run a search on Wayback Machine for <a href="http://www.berkeley.edu">www.berkeley.edu</a></td>
<td>1. Search capability not practical, too limited. I don’t like the scroll down menu. Why are there more pages for some dates? Why seven years only? Why is there inconsistent frequency in archival? How is the number of search results relevant? So now I have advanced search? It should be appear on the first search page.</td>
</tr>
</tbody>
</table>
| **Completion Criteria:** Search results provided. | **U1:** 2.Q  
**U2:** 1.Q  
**U3:** 2.Q, 4.Q  
**U4:** 2.Q  
**U5:** 4.C  
**U6:** 1.Q |
## Task 3

<table>
<thead>
<tr>
<th>Task and Completion Criteria</th>
<th>Observed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Task:</strong> Search for and locate a personal website.</td>
<td>1. Mechanism for results unclear. Drilling down into results led to pages from different date ranges. I get the look and feel of the original website but without the content. I would have been surprised to find my old website. If the results indicate that the last archived page was in 2000 then this page must not have changed since then. How will the IA archive a web log? Presentation of search results is coherent, understandable and usable.</td>
</tr>
</tbody>
</table>
| **Completion Criteria:** Search results provided. | **U1:** 2.C, 3.Q  
**U2:** 4.Q  
**U3:** 1.C  
**U4:** 2.Q  
**U5:** 2.Q  
**U6:** 2.X |
<table>
<thead>
<tr>
<th>Task 4</th>
<th>Observed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Task and Completion Criteria</strong></td>
<td><strong>Observed</strong></td>
</tr>
<tr>
<td><strong>Task 4:</strong> Search for a popular news site.</td>
<td>1. I am happy with the results and that they are presented but I am disappointed that when I click on links it either fails or the information is only partially available. I expect this to show me how the news site looked back then. Results indicated no data for some years and that is not accurate. The advertising stored with the original website is valuable, the meaning is preserved in context, it’s like a cultural reference to that time. Feels like a nostalgia trip, but I don’t know of other uses. I get the look and feel of the web site but no content.</td>
</tr>
</tbody>
</table>
| **Completion Criteria:** Search results provided. | **U1:** 2.C  
**U2:** 3.Q  
**U3:** 5.Q  
**U4:** 2.Q  
**U5:** 3.Q  
**U6:** 2.C |
User Questionnaire Findings

<table>
<thead>
<tr>
<th>Questions</th>
<th>Score (out of 30)</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Wayback Machine satisfies my research needs.</td>
<td>19</td>
<td>63.27</td>
</tr>
<tr>
<td>Search through the Internet Archive makes my research easier.</td>
<td>14</td>
<td>46.62</td>
</tr>
<tr>
<td>I would add the Internet Archive as one of my current research locations.</td>
<td>20</td>
<td>66.6</td>
</tr>
<tr>
<td>The Wayback Machine primarily serves personal research interests.</td>
<td>18</td>
<td>59.94</td>
</tr>
<tr>
<td>Overall, the Wayback Machine is a valuable and useful system.</td>
<td>24</td>
<td>79.92</td>
</tr>
<tr>
<td>The Wayback Machine is fun but not very useful for my current research needs.</td>
<td>20</td>
<td>66.6</td>
</tr>
</tbody>
</table>

Themes

This section lists a set of central ideas extracted from the user responses. They are listed without redundancy as much as possible, although some may inherently be inter-related. Also, representative quotes provided under each theme substantiate their relevance.

1. **Unique Service:** All the users felt that the Internet Archive provides unique information that is not readily available elsewhere.

2. **Inadequate Interface Design**
   a. “Many resources I use have their own archives. The Internet Archive needs to present better metadata to help me find what I looking for.”
   b. “Result screen shows a lot of results but could explain why so many results for one day but fewer for others.”

3. **Ease of Use:** Although several users commented about the User Interface, all users felt that the Internet Archive was not something new or unknown, and did not find the Internet Archive difficult to use.

4. **Limited Search Mechanisms**
   a. “Faceted search features like Event + date or Entity + event + date”
   b. “The search feature does not allow you to really benefit from the archive.”
   c. “The archive has a lot to offer, but in this current form you can't really get at it.”
   d. “It’s a good nostalgia trip to see the look and feel of old sites, but getting specific content is not easy.”

5. **Does the Internet Archive have/provide the information that I need?**
   a. “I think that the Internet Archive only targets sites that change frequently with time”
   b. “More organization by event”
6. **How does the Internet Archive categorize the information?**
   a. “Better introduction to the archive.”
   b. “An explanation of what is archived and how often, and why certain pages seem to be missing” has to be provided.
   c. “Ability to submit your site, ability to email out articles you find on the Internet Archive, ability to collect and personalize information.”

7. **How does the Internet Archive present the information?**
   a. “Time/context when browsing archived pages so you know where you are, forward/backward and hierarchical traversal features.”
   b. “Inconsistent caching of pages, a lack of time stamp on pages of a website and caching w/o people's knowledge could have potential problems.”

**Telephone Interviews**

The telephone interviews were designed specifically with qualitative heuristics in mind, as suggested by Weiss ([footnote: Learning from Strangers: The Art and Method of Qualitative Interview Studies, Robert Stuart Weiss](#)). This design functioned not only as a guide for neutral, unbiased qualitative data collection but also as a way to extract some useful context on the user base itself. By orienting our interviewees through more general questions that assessed their familiarity with technology, computers, and the Internet, we were able to better engage them. We implemented easy-to-answer questions (as discussed in our tool design above), established a level of comfort and flow for the rest of the interview, and then documented some high-level quantitative data about our interviewees in addition to documenting use scenarios and extracting themes.

**Quantified Background Information**

The following tables summarize some general characteristics about the base of interviewees. Although there is wide variation in their experience with the Internet Archive, most were well-grounded in the use of computers and the Internet, if not a professional in this field of work. In fact, most of them were made aware of the Archive’s existence through some form of digital media, suggesting a high degree of comfort with computers among the participants. In addition, six of the seven participants were able to differentiate between the Internet Archive and the Wayback Machine when asked.

<table>
<thead>
<tr>
<th>Question</th>
<th>Word-of-mouth (friend, colleague, etc.)</th>
<th>Digital Media (i.e. public newsgroup, email, Internet surfing, on-line articles)</th>
<th>Print Media (i.e. newspaper, magazine)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you recall how/from where you first entered the Internet Archive?</td>
<td>1</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Question</td>
<td>&gt;6 yrs</td>
<td>&gt;4 yrs</td>
<td>1-2 yrs</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>--------</td>
<td>--------</td>
<td>---------</td>
</tr>
<tr>
<td>For how long have you been using the Internet Archive?</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>Computer/Technical Professional</th>
<th>Web/Technology Enthusiast</th>
<th>Hobbyist/Homemaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profession? What do you do?</td>
<td>6</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

**User Group Categories**
We can further divide our user definitions into a three primary categories:

**Primary Users**
- Technical Professionals
- Web Enthusiasts
- Hobby/Homemakers

**Primary Users**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Professionals</th>
<th>Web Enthusiasts</th>
<th>Hobby</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personal</strong></td>
<td>Very computer literate, technical professional. Computer is central to daily life.</td>
<td>Highly to relatively comfortable with computers and the internet. May use computer for work and for play.</td>
<td>Likes the internet and uses search fairly often. Would not use computer for work, more for play.</td>
</tr>
<tr>
<td><strong>Experience</strong></td>
<td>Likely to have extensive experience with digital search.</td>
<td>Likely to have extensive experience with digital search.</td>
<td>Less likely to have experience with digital search.</td>
</tr>
<tr>
<td><strong>Goal</strong></td>
<td>Use varies, but mostly for work-related activities and significant time allocation to internet.</td>
<td>Likes the web and dedicates significant amount of personal time to internet.</td>
<td>Uses internet for specific tasks and does not spend more time than necessary to perform task.</td>
</tr>
</tbody>
</table>
Major Themes

This section lists a set of central ideas extracted from the user responses. The themes also summarize the data gathering process and results. This moves away from comments by question, since not all questions were relevant to any given interview. They are listed without redundancy as much as possible, although some may inherently be inter-related. Also, representative quotes provided under each theme substantiate their relevance.

1. **What are people searching for?** People reported to be using the Internet Archive and the Wayback Machine to find the following information.
   a. To look for graphics from old Web pages, retrieve content that was not personally archived before
      i. “It’s like a museum of my work”
   b. To look up one’s personal Web site
      i. “I don’t really use [the Archive] a whole lot except to check my own site’s history.”
   c. Desire to view artifacts of the ‘big, pioneering’ Web pages from the early days of the Internet
   d. Article search
   e. To locate a recipe
   f. To find Java source code files

2. **What other uses are people find for the Internet Archive?** To restore compromised references when the same or a similar live reference no longer exists; re-indexing

3. **People’s comments on using the Internet Archive:**
   a. Links that either don’t function or misdirect/send you to the wrong place
   b. Inconsistent archiving of graphics files
      i. “I had only one image in the center of the page that wasn’t there.”
   c. Server timeouts before search results or archived pages are displayed
   d. No pattern in search results page; seemingly random archiving methodology. No confidence in accuracy of search results
   e. Lack of awareness of an advanced search feature available in the system
      i. “I don’t remember seeing this option anywhere.”
   f. Specific requests for text/keyword and timeline search options, primarily using Google as their artifact for comparison
      i. “It would be a big plus to have other ways of searching the archive”
      ii. “Having a regular search interface for the archive would be REALLY useful…”
      iii. “The design [for search] isn’t user-centric enough”
      iv. “I prefer just to use keywords.”
      v. “There aren’t enough hours in the day to go through the thought process of figuring out how to search always using the URL.”
g. “Code (Java) resources/files not available through the Archive and is information that should be included if it’s not a part of dynamic content generation”.

h. Lack of feedback from the system about the live/archived boundary
   i. “I really wanted feedback to know that I was exiting the Archive.”

i. The Archive claims its collection to be comprehensive – but search results are incomplete – this is misleading leads to disappointment. There is a n to communicate the depth of archival
   i. “It’s like having a library of the first two chapters of all the books” in a book collection.”

j. Addressing legal issues, authorization, and use with disclaimers
   i. “there should be a registration process where the Archive asks permission to crawl the sites instead of forcing the owners [of publicly available sites] to install a robots.txt file to prevent the crawl.”
   ii. “At least Google has disclaimers about caches.”
5.0 Recommendations – Preliminary Phase 1

The mission of this project was to help the Internet Archive (http://www.archive.org) and specifically the Wayback Machine, understand the requirements of their growing user base. Different phases of this process - identifying users, studying user experience and behavior, heuristic and qualitative analysis have been presented so far. At the end of this data collection and analysis, we realize that this is merely a first-phase activity. Our recommendations reflect this fact. This section provides an exhaustive list of recommendations for the Internet Archive to meet the demands of its growing user population. The information presented in this section has been arranged to facilitate the reader’s understanding and has not been prioritized in any way.

5.1 Vision of Wayback vs. User Practicality

The vision of the Internet Archive and the Wayback Machine is to present information in a non-biased format that allows the user to derive value directly from the information. User Practicality is the actual functionality and effectiveness of the Archive as perceived by the users which we will weigh against the vision of the Archive as presented to us by Brewster Kahle.

There appears to be a consistent feeling that the archive is a unique, valuable and useful system. Clearly one half of the user population declares this to be the case. The other half, who does not find the Archive particularly useful, needs to be studied closer to determine what would add value to them.

All the users were successful in the user test tasks. They were able to accomplish what the task required of them. This study was carried out on a small random sample of users. There exists a much larger pool of respondents who have provided feedback to the Internet Archive, who need to be studied in the next phase of analysis.

The choice of the name ‘Wayback’ to describe the search functionality is appropriate. Most users found the concept easy to understand. Users were able to make sense of the interface. Our report found almost unanimous user comfort with the system and layout. The other comments primarily addressed improvements to better facilitate communication of functionality. We suggest that the “Take me Wayback” functionality be prominently explained and described on the website.

5.2 Look & Feel

The users immediately understand that they need to enter a URL into Wayback to facilitate search. The placement of the Wayback search bar near upper center of page is good design. This was reported to be reminiscent of Google and easy to use. This proves a simple and clean entry point into the archive. The first time user finds this to be an intuitive and friendly interface.
The more experienced users ask for aesthetic and minimalist design. They report that the index page has too much information. The index page contains too much information in its categories and columns that do not concern the user, it was called “not user-centric.” Instead, it should contain information about the Internet Archive – like for example, how much information the Archive contains or disclaimers on how data should be used.

5.3 Search & Results

All users intuitively understood the display of Wayback search results. The current format displays years as columns and relevant search results for that year as rows in that particular column. The absence of any confusion on the part of the user in interpreting the search results is mentionable. However almost every single user raised the question, “Why are the results spread out over time?” Users reaction varied from curious or puzzled to totally confused because of the presentation of the results. The haphazard presentation made users doubt the accuracy and validity of the Internet Archive. We recommend that search results be presented along a standard time line. The columns have been standardized into years; we recommend that the rows (of that page) be standardized to the time period or archival (days, weeks or months).

The other question that came up was – “What happens a few years later”. We recommend the Internet Archive communicate its policies about displaying search results by publishing the same on its web page.

The simplicity of the Wayback search is one of its greatest advantages and leads to one of its disadvantages. Users have trouble remembering perfect URLs and searching for information merely based on URLs. We recommend other methods to access the information in the Internet Archive

1. Ability to make personalized collections of websites
2. Provision of a Directory service: An index or classification of URLs to facilitate information retrieval according to subject
3. URL Recommender System: System to suggest URLs based on one URL or text
4. Search Recommendations:
   - Advanced Search: The existence of the advanced search feature is unknown to most users. Currently advanced can be accessed only from the results page of an initial ‘simple’ search. Making advanced search available on opening page and linking advanced search from more prominent and noticeable positions will facilitate usage.
   - Text Search: Ability to search by inputting a word or phrase
   - Event Search: Ability to retrieve web pages pertaining to an event.
   - Faceted Search: Ability to perform searches based on user’s choice of criteria.

5.4 Technical Capability

Expert users mentioned time outs while searching and waiting for search results. This is a system and server issue that needs to be addressed. User satisfaction in result retrieval is vital to the effective and widespread proliferation in the use of the Internet Archive.
• The Archive must ensure that no technical issues arise.
• All errors are explained with relevant error messages
• And that error messages are non ambiguous
• Steps must be taken towards error prevention

Users also wish to submit their website for periodic archival. This ability needs to be provided and communicated effectively to the users. Similarly certain users wish to maintain their privacy and do not want their web sites archived. The Internet Archive’s policy on such requests also needs to be clearly communicated to the user.

5.5 Communication

There is an evident lack of understanding on the part of the user. Users are not demonstrating a clear comprehension of the enormity and power of the Internet Archive. Recommendations on how to help users understand and better use the Internet Archive are:

1. Provide use-case scenarios/example uses of the Internet Archive to guide the first time user.
2. An exhaustive, context specific, and ubiquitously accessible FAQ.

Recommendation on the questions that this FAQ should address are:
   a. Where does the archive store all this material?
   b. How does the archive store all this material?
   c. How the internal information storage/retrieval structure work?
   d. What standards are implemented?
   e. What are the Internet Archive’s policies on IP, Archival, Storage, Usage?
   f. The frequency at which archival is done and why?
   g. What does requesting a crawl do differently than normal archival?

5.6 Threshold, Expectations and Use Scenarios

We believe there is an amount of time the user will try to use the Wayback successfully after which the user will not return. Users have a performance expectation when entering the archive. If they are not able to use the archive effectively or they do not understand the results, they are much less unlikely to use the site again for search. As a result, we recommend that the Archive provide a visible system status display for the user to understand the system and what it is doing. We also feel that the Archive should provide directions to use the Wayback Machine and its search functionality. The interface should constantly interact with the user updating him about whether the search is running, why certain results were returned and why others are missing. We feel the interface should help users recognize, diagnose, and recover from errors and provide a substantial Help/About Us/ Tutorial Page to clarify certain ‘Frequently Asked Questions’ like:

Why is the advanced search made available only after the initial search is performed?
Why is it that sometimes when we drill down to a particular result, believing ourselves to be in one particular time period, we are thrown into another time period without warning?

For example: I go Wayback to see cnn.com – I click on one result for April 1998. I am taken to an archived website. Next, I click on one of links on that archived web page – I believe that I should still remain in the April 1998 cnn.com domain; however I am taken to a web page in another month. Why does this happen?

A common use scenarios section for the interface would be valuable in helping users access information in the most efficient way. We have users looking for graphics, old personal site pages, articles, compromised paths to digital references, source code, and recipes.

Ultimately, users are very clear about what the Wayback does and there is also a high comprehension level. These suggestions are to further facilitate use and success in use of the Wayback Machine.

5.7 Scalability & Reliability for Globalization

Accuracy determines archive permanence and relevance for use, therefore the archive needs to be correct and reliable. We suggest a plan to look ahead into future archived years and focus on the accuracy and reliability of the archive for a global population of users. The current display may not accommodate many more years of data in a comprehensible format. For the sake of the historical significance of the archive, there is a real need to preserve in tact all information that is stored and newly cached. The digital nature of the archive creates a flexibility that makes it very portable and globally available. We believe that this is an opportunity to capture valuable information on the web and present it in a friendly and intuitive setting for users everywhere.
6.0 Conclusions

Our group findings of the Internet Archive and the Wayback Machine indicate that the service is a valuable and unique one in which many types of people interact. Our research was the first phase in the preliminary findings area and we recommend the development of further phases for a more comprehensive use profile. Future research methods could be to conduct extensive field study and interviews with more users, an online survey for Archive visitors and implementation of design considerations that are more user-centric. A thorough future examination of the archive should also look for areas of growth and expansion of the Archive based on current usage. For example, if users are interested in the bottom statistical portion of the Archive, then it should be made more prominent on the opening page.

Whereas our findings often pointed in directions we expected, there were also some unexpected findings that we were pleased to discover and present to the IA Founder. The typical archive user is a computer professional, but we did not expect there to be a significant use population represented by homemakers and hobbyists looking for recipes and articles. The unexpectedness of the use was incorporated into our recommendations for a friendlier interface that also prominently explains its technical capacity and search mechanism.

Our experience and work with the Archive indicated to us that there is a wealth of valuable information contained within the Archive and tapping into the best way to make it available should be the ultimate concern in meeting the vision of the Archive and making it a tool that users return to again and again.
7.0 Appendices
7.1 Business Proposal

Wayback Machine Project Proposal
Submitted to Brewster Kahle and Peter Lyman
Prepared by Pallavi Aravind, Vanessa Arce, Peter Roessler
February 20, 2002

Parent Company:
(The Internet Archive, [www.archive.org])

The Internet Archive is a comprehensive web-based digital library that continually crawls all public Internet pages and archives them. These archived web sites are available for public access through the Wayback Machine service.

Project Mission, Goals, and Objectives:

Mission: The mission of this project is to help the Internet Archive, specifically the Wayback Machine ([http://www.archive.org]), understand and satisfy the requirements of their growing user base.

Goal 1: Identify users of the Wayback Machine and study the user experience.

Objectives:

a. Identify the user base.

b. Perform user studies and needs assessment (focus groups and surveys).

c. Analyze survey results and any segmentation in the user base.

Goal 2: Study user behavior.

Objectives:

a. Study Internet Archive user logs.

b. Identify patterns and trends in user logs.

c. Perform comparative analyses between user logs and user studies.
Goal 3: Make recommendations to enhance the user's experience with the Wayback Machine.

Objectives:

a. Perform comparative analyses between existing features and those that the user wishes to see through usability assessments.

b. Arrive at a list of modifications in features and functionalities of the Wayback Machine.

Project Deliverable: This project will culminate in a White Paper recommending specific functionality additions, extensions or modifications to the Wayback Machine.
7.2 Research References

http://www.rlg.org/ArchTF/tfadi.index.htm
http://images.jsc.nasa.gov/
http://nsarchive.chadwyck.com/
http://www.rootsweb.com/~usgenweb/
http://www.sntc.org.sz/sdphotos/
http://jarda.cdlib.org/
http://www.library.ucsf.edu/tobacco/
http://mcel.pacificu.edu/JAHC/JAHCI13/P-REVIEWS/holcomb.html
http://www.jisc.ac.uk/dner/preservation/richtext/digital-seminarrepdg.htm
http://dream.sims.berkeley.edu/wayback/biblio/lymanWHY.pdf
http://sfgate.com/cgi-bin/article.cgi?file=/chronicle/archive/1998/05/07/BU3256.DTL
http://www.rlg.org/ArchTF/tfadi.index.htm
http://www.jisc.ac.uk/dner/preservation/richtext/digital-seminarrepdg.htm
http://dream.sims.berkeley.edu/wayback/biblio/lymanWHY.pdf

7.3 Heuristic Evaluation & Supplementals

Heuristic Analysis Supplemental Material
Jacob Nielsen’s Heuristic Guidelines
These guidelines are reproduced from Nielsen's list at [http://www.useit.com/papers/heuristic/heuristic_list.html](http://www.useit.com/papers/heuristic/heuristic_list.html)

1. Visibility of system status: The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

2. Match between system and the real world: The system should speak the users’ language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

3. User control and freedom: Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

4. Consistency and standards: Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

5. Error prevention: Even better than good error messages is a careful design which prevents a problem from occurring in the first place.

6. Recognition rather than recall: Make objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

7. Flexibility and efficiency of use: Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

8. Aesthetic and minimalist design: Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

9. Help users recognize, diagnose, and recover from errors: Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

10. Help and documentation: Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.
7.4 User Test Material

Internet Archive Usability Evaluation
User Instructions

Monitor orients the user: Explain that the user will access the URL and perform various tasks.

Tasks

1. Ask user to use any browser to go to [http://www.archive.org](http://www.archive.org). Then ask the user to examine the Internet Archive visually. Ask user for first impression feedback about site.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Errors ___ Time to complete ___

2. Ask the user to enter a search into the Wayback Machine. Ask the user to run a search on [www.berkeley.edu](http://www.berkeley.edu). Ask user for first impression feedback. Ask user what he/she thinks about the results.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Errors ___ Time to complete ___

3. Ask the user to search for and locate a personal website. Ask user what he/she thinks about the results.
4. Ask the user to search for a popular news site on the Wayback Machine (like CNN). Ask user what he/she thinks about the results.

Errors ____  Time to complete ____
7.5 Pre and Post-User Test Questionnaire

Wayback User Questionnaire

This questionnaire has been designed to help our group gather information on the Internet Archive (www.archive.org) and specifically the Wayback Machine.
Your answers are anonymous and will not be used for purposes other than this project.

Please answer all questions as truthfully and completely as is possible. 
Please let us know if you have any questions.

Occupation: 
Gender: 
Age: 18-25  26-35  36-45  46-55  56-65

Part One: Pre User Test

1. Prior to this study, had you ever heard of the Internet Archive or the Wayback Machine?
   □ Yes
   □ No

2. Prior to this study, had you ever used the Internet Archive?
   □ Yes
   □ No

3. Do you feel that you have a good understanding of what the Internet Archive is?
   □ Yes
   □ No

   Why? Please feel free to explain:

4. How many hours per week do you spend researching online (academic and personal)?
   ____________________ hrs

5. Please name the website locations you use most frequently for research below.


6. What are your primary uses for the locations listed above? (Check as many as apply)
   □ Check news or world events
   □ Downloads and updates
   □ Access secure (password protected) personal information
   □ Access secure (password protected) employment/intranet information
   □ Others: ____________________
7 Please rank each of the following uses by importance (1 being the most useful)
☐ Check news or world events
☐ Download and updates
☐ Access secure (password protected) personal information
☐ Access secure (password protected) employment/intranet information
☐ Others: _______________________________________________________________________________

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Indifferent</th>
<th>Strongly agree</th>
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**Part Two: Post User Test. Please provide your answer on a scale of 1-5**

8 The Wayback Machine satisfies my research needs.

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Why?

9 Search through the Internet Archive makes my research easier.

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<td></td>
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10 I would add the Internet Archive as one of my current research locations.

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11 The Wayback Machine primarily serves personal research interests.

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12 Overall, the Wayback Machine is a valuable and useful system.

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13 The Wayback Machine is fun but not very useful for my current research needs.

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**Part Three: Post User Test.**

14 What are the problems with the Wayback Machine? (You can select more than one answer)

☐ Does not provide unique information that is not readily available elsewhere
☐ Does not save me time
☐ Does not provide the information I need
☐ Inadequate interface design
☐ Limited search mechanisms
☐ New to me - difficult to use / understand
☐ Serves limited research purposes
☐ Others: _______________________________________________________________________________

15 What functions should the Wayback Machine add?
16. What other kinds of services would you like to see in the Wayback Machine in the future?

17. Is there anything you want to add?
   □ No
   □ Yes. If so, please use the following box for your comment.

Thank you!
7.6 **Phone Interview Questionnaire**

Telephone Interview Questionnaire

1. How did you find out about IA?
2. How long have you been using it?
3. Profession? What do you do?
4. Do you differentiate between the IA and the Wayback Machine?
5. Uses of IA?
6. Did you run across any limitations when using it?
7. How comfortable are you with a computer? Search service? (moderately, very comfortable, not comfortable)
8. Experience with archives?
9. Have you used a similar service? Was it manual or automated?
10. Do you recall how/from where you first entered the IA? Did you hear about it from a site link (what site), word of mouth, e-mail, article?
11. Have you heard of the Alexa toolbar?
   Do you use IA for professional uses or other (personal / entertainment)?
## 7.7 Phone Interview Coded Results

### Column Description Key
1. Actual Questions: The prepared questions for the interview.
2. Observables: Gestures, voice inflections and other characteristics of the interview that are not included in the actual response.
3. Actual Responses: The verbatim answer to the interview questions.
4. Other Notes: The interviewer’s overall feeling, notes and conclusions about the interview question.

### Interview VA1

<table>
<thead>
<tr>
<th>Actual Questions</th>
<th>Observables</th>
<th>Actual Responses</th>
<th>Other Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How did you find out about the Internet Archive?</td>
<td>Casual attitude, but not careless. Thinking for few moments when answering.</td>
<td>Referred by professional friend about one and a half years ago.</td>
<td>Male, at work, late afternoon.</td>
</tr>
<tr>
<td>2. How long have you been using it?</td>
<td>Short sigh.</td>
<td>About one and a half years.</td>
<td></td>
</tr>
<tr>
<td>3. Profession? What do you do?</td>
<td></td>
<td>IT Consultant</td>
<td></td>
</tr>
<tr>
<td>4. Do you differentiate between the Internet Archive and the Wayback Machine?</td>
<td>Pause, seems to consider if this is a trick question. Abruptly responds with answer and pauses again.</td>
<td>Internet Archive is the database and Wayback is the functionality.</td>
<td></td>
</tr>
<tr>
<td>5. Uses of Internet Archive?</td>
<td></td>
<td>Used first to look up old websites and then later to locate java source code.</td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Response</td>
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</tr>
<tr>
<td>6. Did you run across any limitations when using it?</td>
<td>Source code not available. I’d prefer if the original java scripts were available.</td>
<td></td>
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</tr>
<tr>
<td>7. How comfortable are you with a computer? Search service?</td>
<td>I’ve been here 4 years as IT consultant, and also have my MCSE (Microsoft certified systems engineer).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Experience with archives?</td>
<td>Confused by question. Asks me to rephrase it.</td>
<td></td>
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<tr>
<td></td>
<td>I’ve used MSDN database, MS development DB and websites.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Have you used a similar service? Was it manual or automated?</td>
<td>See above.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Do you recall how/from where you first entered the Internet Archive? Did you hear about it from a site link (what site), word of mouth, e-mail, article?</td>
<td>Entered from Alta Vista search on “Wayback Machine.” Originally heard about it from a friend who sent me a link in an e-mail.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Have you heard of the Alexa toolbar?</td>
<td>No, not really.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Do you use the Internet Archive for professional uses or</td>
<td>First use was personal, next time was for professional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actual Questions</td>
<td>Observables</td>
<td>Actual Responses</td>
<td>Other Notes /Inference</td>
</tr>
<tr>
<td>------------------</td>
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</tr>
<tr>
<td>1. How did you find out about the Internet Archive?</td>
<td>Voice and attitude suggests an air of authority. Before the interview begins he asks me who is at CS dept. these days.</td>
<td>Heard about it from a newsgroup.</td>
<td>Male, at home, early afternoon.</td>
</tr>
<tr>
<td>2. How long have you been using it?</td>
<td>First time was a few months ago to look up an article about a recipe in The Onion archive. But I heard about it years ago.</td>
<td>I’ve been using computers professionally since college in 1977.</td>
<td></td>
</tr>
<tr>
<td>3. Profession? What do you do?</td>
<td>Raises voice slightly, seems to suggest that answer is obvious.</td>
<td>Well, Wayback Machine, Archive, you can’t have one without the other, right?</td>
<td>At this point, the interviewee seems annoyed and a little aggressive. I am neutral to his tone. In answer to his response question, I say “thank you” and “OK” and move to the next question.</td>
</tr>
<tr>
<td>Question</td>
<td>Response</td>
<td>Notes</td>
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<tr>
<td>5. Uses of Internet Archive?</td>
<td>Long sigh, voice begins to rise and he repeats phrases in his answer, “The real uses are not what they say, the real uses are not to look back at history, it’s for people to find personal things that are not there anymore.”</td>
<td>Interviewee continues to seem agitated. He is now answering my questions with his own questions. He seems to want more objective feedback and some critique from me.</td>
<td></td>
</tr>
<tr>
<td>6. Did you run across any limitations when using it?</td>
<td>Doesn’t need to think about this answer, he is ready and begins what sounds like a laundry list of items.</td>
<td>The interviewee seems very certain of what is wrong with the archive. I suspect he given this some thought.</td>
<td></td>
</tr>
<tr>
<td>7. How comfortable are you with a computer? Search service?</td>
<td>Very comfortable, as I mentioned before.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Experience with archives?</td>
<td>Agitation continues. What do you mean by archive?</td>
<td>He is persistent in asking me to clarify what an archive is. I mention reference books and web search. He seems flustered.</td>
<td></td>
</tr>
<tr>
<td>9. Have you used a similar service? Was it manual or automated?</td>
<td>More clarification needed. He is not friendly or nice at all by this point.</td>
<td>As an interviewer, I am calm and focusing on writing rather than reacting.</td>
<td></td>
</tr>
<tr>
<td>10. Do you recall how/from where you first entered the Internet Archive?</td>
<td>He slightly relaxes.</td>
<td>Yeah, from a URL posted to the newsgroup. I heard about it from a news</td>
<td></td>
</tr>
</tbody>
</table>
you hear about it from a site link (what site), word of mouth, e-mail, article?  

<table>
<thead>
<tr>
<th>Actual Questions</th>
<th>Observables</th>
<th>Actual Responses</th>
<th>Other Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Profession? What do you do?</td>
<td>He takes a deep breath and seems totally composed. As he answers, he repeats the phrase, “if money was thrown at it” a total of 4 times.</td>
<td>The archive needs more practical search capabilities. It would work if money was thrown at it. There are too many missing pages.</td>
<td>I feel that he would like to continue talking, he starts to ask me about the results of this research and my graduation. I answer, thank him for his time and conclude the interview.</td>
</tr>
<tr>
<td>12. Do you use the Internet Archive for professional uses or other (personal / entertainment)?</td>
<td>Calmer now.</td>
<td>Personal and entertainment.</td>
<td></td>
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</tbody>
</table>

Interview PR1

Web site developer for a non-profit site on animal care and shelters.  

Found it more intuitive as a way of getting the volunteer engaged to ask about their...
<table>
<thead>
<tr>
<th>2. Do you recall how/from where you first entered the Internet Archive? Did you hear about it from a site link (what site), word of mouth, e-mail, article?</th>
<th>Employed as a volunteer doing similar work at a local animal shelter.</th>
<th>She was certainly thinking a lot and pausing as she tried to remember her first experience</th>
<th>She came across a ‘Wayback Machine’ button off of some site (doesn’t remember) while surfing for information and happened to have the time to explore/test it. Her initial impression was that it was a bogus link to something useless.</th>
<th>She mentioned 9/11 link. She thought, “Come on.” Did’t even realize the Wayback Machine was an archive. Felt the following 2 questions were similar enough to combine: Do you recall how/from where you first entered the IA? Did you hear about it from a site link (what site), word of mouth, e-mail, article? and How did you find out about IA?</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Do you differentiate between the Internet Archive and the Wayback Machine?</td>
<td>She seemed a bit stuck on this one</td>
<td>It’s not very clear. “I guess I understand.” It’s not very clear to her how searchable the Archive actually is.</td>
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</tr>
<tr>
<td>4. Uses of Internet Archive?</td>
<td>This was a more natural question for her since she could answer this within the context of her work</td>
<td>There are specific articles she would like to retrieve. Biggest problem solved by the Wayback machine; able to restore compromised references. When links die that point to crucial information, it’s nice to be able to use the URL to pull up an archived version of the site to retrieve the material. This is a nice addition to her old method for locating the same or similar</td>
<td>She made it clear that her usage pattern was for it to supplement the more laborious process of making sure her links referenced live data/information</td>
<td></td>
</tr>
<tr>
<td>5. Did you run across any limitations when using it?</td>
<td>Her comment on her need for live information was spoken as if it should be obvious to anyone, without the need for explanation. It's frustrating when you don't happen to have the URL handy that pointed to the needed information. Sometimes sifts through the code of old pages looking for a URL to use with the Wayback interface. She has copies of old site at different points in time already but has no verifiable proof that certain versions were ever live. Example: Had the site on Geocities; it was not archived for the time it was there. She felt, therefore, that the search results were not complete. Also, even though the information you are trying to retrieve may be static, it is still better sometimes to find the</td>
<td>She didn't seem to have an explanation for why she might need to have verifiable proof that her site was live at any point in time.</td>
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<tr>
<td>Question</td>
<td>Response</td>
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<tr>
<td>6. Have you heard of the Alexa toolbar?</td>
<td>She was a bit embarrassed about how old her computer equipment was and emphasized again the fact that her work is in the non-profit sector. This slowed things down A LOT for her. Her computer is extremely slow (thought the CPU was 166 Mhz), so she needed to uninstall the toolbar after several weeks due to the computer performance decrease. Otherwise liked the toolbar. Page ranking, etc were nice features.</td>
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</tr>
<tr>
<td>7. Do you use the Internet Archive for professional uses or other (personal / entertainment)?</td>
<td>Her personal and professional life is somewhat blurred, so these uses are more or less one in the same.</td>
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</tr>
<tr>
<td>8. Do you have any other comments?</td>
<td>“It would be a big plus to have other ways of searching the archive”, as was mentioned above concerning the specific articles she would like to retrieve. Always having your search process revolving around the URL search drives the process and shouldn’t. “There aren’t enough hours in the day to go through the thought process of figuring out how to search always using the URL.” Added this free-form question at the end. This seemed fruitful. She corroborates here about her preference to update dead links herself when maintaining her site; not encouraging the perusal of dated information with respect to her site.</td>
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</table>
There are other searches she specifically doesn’t run due to this constraint.

No longer interested in using Wayback on the site (see original comment from email to the IA below). She thinks this encourages/invites looking at earlier versions. In her case, she puts a lot of effort into keeping the live site as current as possible and wouldn’t want to encourage the perusal of dated information (in her case).

“I still would like to provide an actual WayBack search box on my site. I didn’t want to just swipe the code and stick one on my page without "permission" and there's nothing about this on your site (at least nothing I could find).”

| How comfortable are you with a computer? Search service? Experience with archives? Have you used a similar service? Was it manual or automated? |
|---|---|---|
| Skipped these questions since it seemed obvious that this might steer the focus away from thinking about the archive because she already told me she was a Web developer |

<table>
<thead>
<tr>
<th>Post-interview comments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Having a regular search interface for the archive would be REALLY useful. I was talking to my husband about your</td>
</tr>
</tbody>
</table>

This was provided by email a few hours after the phone interview
call and he said that there have been many times that he’s searched and located an article; then tried to locate it again (months later) with the same search only to find that the article had been removed.”

### Interview PR2

<table>
<thead>
<tr>
<th>Actual Questions</th>
<th>Observables</th>
<th>Actual Responses</th>
<th>Other Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Profession? What do you do?</td>
<td>She was busy getting her son off to school, so was a bit frazzled and needed me to call back after our appointment so she would have enough time to talk. She seemed to be gloating here and was somewhat verbose.</td>
<td>Is the owner and Webmaster for a Genealogy Web site (CyndisList.com); a categorized index for information on the Internet related to genealogy. Her site is one of the top 5 sites of its kind, is widely publicized, and has been on-line since 1996. She is also a popular guest lecturer on this topic and is an accomplished author on the subject as well.</td>
<td>Feels “there should be a registration process where the Archive asks permission to crawl the sites instead of forcing the owners [of publicly available sites] to install a robots.txt file to prevent the crawl.” The installation of this file should not be up to the owner of the site when the</td>
</tr>
</tbody>
</table>
Wayback Machine and shared it with her. She didn’t understand how a service or archive like this was possible. She didn’t believe it and was curious enough to check it out on her own after she returned home.

material is the property of the owner, whether or not it is in the public space.

As an author, she gave the Library of Congress permission to store a copy of her book. She feels the IA should do the same. “The Internet is a library too”.

Feels the Archive is a major copyright lawsuit waiting to happen; the robots.txt file is ‘prevention after the fact’.

**3. Uses of Internet Archive?**

She continued on about the specifics of the infringement issue. This would obviously frame our entire conversation.

Feels that the Archive is strictly a copyright infringement. She has had major problems with this in the past. Google has a somewhat similar service where one can access a ‘cached’ copy of a site. This was a couple of years ago. She was upset since Google never asked permission to cache a copy of the site.

Google removed all caches of her site immediately upon request.

She obviously doesn’t really use the Archive. Feels the limitations are with the way the Archive goes about crawling and archiving the Web.

“The Wayback Machine is worse

Her one comment related to the question was to describe how others have obviously used her material. No distinction was made about whether the material was actually obtained through the Archive or through the live site.

Her comment about the Archives methods, policy, and usage intentions seemed plausible.
than Google!" The IA has a FULL archive of her site (she has purposely designed her site to not have more than two subsequent levels under the homepage through any link so crawl results in full cache).

She has also noticed countless times new sites that mirror her work or steal graphics she has put her own time into creating.

### 4. Experience with archives?

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<thead>
<tr>
<th>Question</th>
<th>Response</th>
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<tbody>
<tr>
<td>Sounded pensive.</td>
<td>She has used a cached version of her site in the past as an indexer.</td>
</tr>
</tbody>
</table>

I decided to include this question when I remembered USGenWeb, an archive of public records used for geneology research.

This seemed hypocritical to me, and not the seemingly hypocritical statement I was expecting, so I drill into this with her by adding Questions #5 and #6, due to the response to Question #4.

### 5. Would you then prefer to not have access to the service at all?

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
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<tbody>
<tr>
<td>As expected, she sounded somewhat defensive here. Her point about IA policies being of paramount importance was made very clear.</td>
<td>She feels the Archive needs to go through the same process as any other archive or library does with authors. She feels this archiving is happening just because the technology is there to make it possible, yet without any</td>
</tr>
</tbody>
</table>
| 6. How, then, would you feel about the Archive if it at all appeased your concerns? | She seemed to enjoy providing these suggestions. | She feels that she would definitely use the service.  
“The design isn’t user-centric enough”, concerning the search mechanism.  
Wonders if technology is developed enough to make the active informing and permission asking of crawls not as tedious as it sounds (see Question #2 Other Notes). | This question phrasing seemed necessary in this particular case in order to get the copyright issue out of her head and get some other suggestions from her. |
|---|---|---|---|
| 7. Did you run across any limitations when using it? | Her tone was a bit sarcastic when talking about Google in comparison. | Sporadic; big pauses in crawl, results didn’t look complete/comprehensive.  
Felt the description on the site was unclear.  
“At least Google has disclaimers about caches.” She would like to see feedback here about how and why they perform the public crawls. | Backtracked after copyright comments to the limitations question, but don’t think it needs to be moved in future interviews. |
<table>
<thead>
<tr>
<th>Do you have any other comments?</th>
</tr>
</thead>
<tbody>
<tr>
<td>How comfortable are you with a computer? Search service? (moderately, very comfortable, not comfortable)</td>
</tr>
<tr>
<td>Have you heard of the Alexa toolbar?</td>
</tr>
<tr>
<td>Do you use IA for professional uses or other (personal / entertainment)?</td>
</tr>
<tr>
<td>How long have you been using it?</td>
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</table>

suggested something like ‘Done with author’s permission and for scholarly purposes.’

Skipped these questions. My time ran out with her to ask anything else. I wrapped up since it had been over 30 minutes.
### Interview PR3

<table>
<thead>
<tr>
<th>Actual Questions</th>
<th>Observables</th>
<th>Actual Responses</th>
<th>Other Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Do you recall how/from where you first entered the Internet Archive? Did you hear about it from a site link (what site), word of mouth, e-mail, article?</td>
<td></td>
<td>There was a blurb about the Wayback Machine in the NY Times ‘Circuits’ section.</td>
<td>Ira couldn’t recall when he saw the article in the Times, so I skipped the question about how long he had been using the Wayback Machine. Original email to the IA was dated February 14, 2002</td>
</tr>
<tr>
<td>3. Uses of Internet Archive?</td>
<td>Seemed pleased that there was this option for him to retrieve old items/artifacts.</td>
<td>For his own site history; says it’s great to have this past art archive. “It’s like a museum of my work” He had actually forgotten a lot of his past Web content until he discovered the Archive since he didn’t really have everything backed up and well-organized from the start.</td>
<td></td>
</tr>
</tbody>
</table>
| 4. Did you run across any limitations when using it? | There was no excitement in his voice or signs that he was more concerned about one thing over another. | The index page didn’t archive from an old version of his site.  
“I had only one image in the center of the page that wasn’t there.”  
Ira had issues with knowing whether or not he was operating in ‘archive-land’ or not. When he drilled down from the home page of an archived version of his site, he was brought out of the archived version to a live page on his current site without any feedback from the Wayback Machine that this was happening.  
“I really wanted feedback to know that I was exiting the Archive.”  
Would provide real visual feedback to use a pop-up window.  
Is interested in a Google-like search.  
“I prefer just to use keywords.” 
Might want a deeper look at some site. With the way sites are currently archived, “it’s like having a library of the first two chapters of all the books” in a book collection. | Along with limitations, Ira had positive comments as well:  
He liked the simplicity of it. Very clear to him how to use it. (Note comment from email: “I don’t really use [the Archive] a whole lot except to check my own site’s history.”)  
He liked the ‘Collections of Information’ links such as ‘September 11’ and ‘Web Pioneers’. He just skimmed these when browsing.  
With the mention of Google search features, I asked Ira if he knew about the advanced search features from the results page on the Wayback (Question #5). |
| Special topics sites that need more in-depth crawling to preserve the data.  
Feels the need for an explanation of what requesting a crawl actually does.  
Doesn’t understand the difference between that and taking no action.  
Does requesting invoke a full crawl of your site?  
Movie archive instructions unclear/confusing.  
Not clear how to actually use it, clearer guideline explanation needed.  
---
| 5. Are you familiar with the advanced search feature? | Ira never uses advanced features of any search engine, so then naturally he never looked for this feature on the Wayback. But, he said “I don’t remember seeing this option anywhere.” |
| 6. Can you think of any other uses for the IA? | Would be good to have a service where you sign-up to receive an email sent to you when the Wayback has detected changes on a site that you are interested in keeping tabs on. This way, if you are using information on that site for some purpose, you can keep yourself as current as possible with respect to the virtual location of that relevant information. |
### 7. Have you used a similar service? Was it manual or automated?

| Google and Lycos. Feature to see what other sites are linked to one’s site. |

### 8. Have you heard of the Alexa toolbar?

| “Put Wayback button on browser”
| Prefers a Google-like implementation of a small search box, not a formatted toolbar that loads a new page for search. The toolbar is somewhat intrusive. |

### 9. Did he feel this service was intrusive with respect to copyright infringement?

| Doesn’t feel it’s the Archive’s responsibility to notify each and every person. It’s a reality of having your artifacts in the public space in this medium that people pull things off your site if they like, anyway.
| “The Archive is not unique here.” Anyone can still go to the site and take graphics, etc. There is no ‘novel infringement’ of copyright here. |

**Added this free-form question at the end. Since Ira is an artist and an owner of original works of art, I felt it would be good to draw out his opinion on the archiving of his personal material.**

**Skipped these questions since it seemed obvious that this might steer the focus away from thinking about the archive because she already told me she was a Web developer.**
7.8 Accessibility Guidelines

Accessibility
Our team conducted preliminary evaluations using automatic systems to determine the effectiveness of the system among persons with disabilities. Accessibility evaluation is of particular importance for systems that may be used by government or government-sponsored organizations. Specific testing was done for those with physical disabilities including:

- Color Blindness / Color Vision Deficiencies (12% of the population)
- Physical Impairments included in the American Disabilities Act (3% of the population)

Method
The evaluators that we used to conduct disability testing included:

- Web Techniques.com

- Lighthouse International

- Bobby Web Accessibility Validator
  [http://www.cast.org/bobby/](http://www.cast.org/bobby/)