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Instructor: Rong Tang

Usability Evaluation of the IQSS Data Science Website

by

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Executive Summary

The new social science area--computational social science--has emerged and IQSS is offering software supporting them. IQSS provides software tools for social science researchers. From an open access data repository to store and share research data, to tools for text clustering, computational software for analysis, and secure tagging software. The IQSS website is a one stop research shop for computational social scientists, and the website has importance as a "primary portal" for tools supporting the researchers.

However, usability research has not been done on the website. This study is the first usability test on the IQSS website. The researchers will investigate 1) Users difficulties while using IQSS website; 2) User difficulties while finding a product that is offered on the IQSS website; 3) User difficulties understand the terminology used in the IQSS website; and 4) Obstacles while interacting with the website. This study provides recommendations for the design and development team at IQSS in order for them to move forward in the next iteration of the website.

The study has four participants, and testing took place in the Simmons Usability Lab, using Morae audio and video recording equipment. A pre-test survey was administered before testing started to gather pertinent demographic information as well as self-assessment regarding familiarity with website and social science research tools. Tasks were presented next, and afterward, the post-survey was taken, asking the participant for feedback regarding their satisfaction with the website navigation, if they would use the site again, and suggestions for improvement. Additionally, heuristic evaluation was conducted by the researchers, which revealed more detailed problems that should be addressed.
The usability testing and heuristic evaluation revealed eighteen problems, falling into four categories: A) Terminology or Label; B) Information or Content Organization; C) Amount of Information; and D) Interface Design. Problems are prioritized for organization of future redesigns. Recommendations offered by the researchers under each category are as follows: A) use more intuitive terminology of “Roadmap”, correct URL on the Zelig page, and clarify the term “Collaborations and Partners”; B) differentiate “Lab” label on the menu, offer access to “Support” from all pages, realign placement of the “Lab” information, possibly becoming a submenu under “Team”, and relocate and rephrase terminology of internship information; C) condense text on the of the homepage, and visualize information on each product page and the lab page; D) add functionality to row titles on the “Roadmap” page, revise various design problems on search results page and software pages, and enhance internal search box function.

1. Introduction

The value of engaging users in development of the website has been established in past usability studies (Redlarski, 2013). This study aims to improve the usability of IQSS Data Science website by conducting usability testing with four participants. Through quantitative and qualitative analysis, the study finds problems in the website and suggests recommendations. The results and recommendations will be sent to the IQSS Data Science team and will be reflected in improvements of the website. Additionally, heuristic evaluations are used to find more detailed problems. To provide support for the necessity of the study, a literature review is conducted.

2. Product Description
The Data Science website is a collaborative community commons of sorts. One of the main attributes of the community is the accessibility: open access and open source code with all software available for free download on Github. All of the tools are feature in a deep orange, cleanly designed navigation bar, across the top of the page.

Since this is a place for social science researchers, specifically, those that use quantitative data, the first software tool displayed is Zelig, “Everyone’s Statistical Software” (http://datascience.iq.harvard.edu/). Dataverse is the next tool featured on the homepage, and this is where collaboration is the focus. The Dataverse allows individual researchers or institutions to create a repository for their research data. Here, the data can be shared to promote further research through replication. The ease of use fosters further collaborative efforts. The third featured product is TwoRavens, open source software for exploring data through visualization and constructing statistical models. This is a very new product developed by the Data Science team that is interactive and easily accessed. Additionally, the team created DataTags, to handle data that is sensitive. The software allows for tagging data with different levels of sensitivity and help with determining the legal issues involved. Information can be tracked to ensure the level of sensitivity is maintained. Consilience is the next tool featured. It is a tool for text clustering, which can help discover new clusters from the data that is compiled. The last tool featured, RBuild, has not been released yet. It will “provide a continuous integration build solution” for R packages. Each of the software tools that have been released has its own page where more information can be found, as well as quick links to current projects and community and support. Most important, there are links to Github, where the software can be downloaded free of charge.
Also featured in the orange navigation bar at the top of the page is a link to the Data Science Lab. This lab is a collaborative initiative which provides the opportunity for scholars and students to work with the Data Science team as interns. Software development projects are designed by cross-disciplinary teams made up of software engineers, statistical and analytical researchers as well as information scientists and archivists.

A secondary set of links, located at the top right side of the page, lead to the Data Science development team’s roadmap, blog, publications, presentations, collaborations, and information about the team. The Roadmap includes detailed information regarding project progress for each of the six tools, release dates, milestone histories, reported issues, and links to Github. In addition to the overall view of the roadmap, each tool has its own page with more details and visuals that display the product’s features. The blog is aimed at the social science research community, with information about talks, conferences and related issues. The links to presentations and publications lead to a wealth of information for researchers, many articles by the Data Science team leaders; all easily accessible in an open environment. The Collaborations link is also a portal to other initiatives at Harvard and beyond, such as the Center for Research on Computation and Society, the Berkman Center for Internet and Society, the Public Knowledge Project, Center for Geographic Analysis, Mind Informatics, and many more. The Data Science team works with these groups on issues such as privacy tools that allow for protection while collaborating; promoting open access on the Dataverse; providing support for geospatial visualization; developing “domain specific metadata”; and partnerships with area hospitals involved in biomedical experiments that need to store and analyze data. This is only a fraction of
the information that is available for social science data analysts available in the community commons that is IQSS.

3. Test Objectives

The main objective is to evaluate effectiveness, efficiency, and satisfaction of the IQSS Data Science website and find problems to be fixed. Testing is done to determine if the interface of the website is easy and friendly enough to use: if participants understand information such as what each product is for; and if do they find all the products easily through investigating the website. Finally, the researchers will provide the IQSS team with recommendations on how to improve the IQSS websites. These recommendations will be focused on the features that are difficult to access, terminology that is difficult to understand, and what should be added or removed.

4. Review of Related Research

4.1 Introduction

Gathering information and making sense of it (evaluation and assessment) is necessary in all aspects of our lives. Over the centuries, new technologies have continued to bring more quantity and improved quality of information. Most recently, powerful technologies that gather exponentially larger amounts of data (petabytes, terabytes) have spurred the next wave of information overload. The age of Big Data has arrived.

Additionally, the number of data science web resources increased dramatically and the number of users who need data science web resources increased as well. Lack (2007) emphasized that it is not enough just to provide access to information in digital format for users,
the usefulness of the websites should also be considered because patrons have more resource choices than ever before. For that reason, it is important for website/software designers to apply usability tests on the data science web resources and products provided in order to evaluate the website and improve it to fulfill the patrons’ needs.

In particular, according to Case (2012), a large proportion of information needs and behavior research has been on scholars’ information needs and behaviors. Understanding researchers’ information needs and behavior is pragmatically important in that it offers a fundamental for devising tools and methods to support researchers. Meanwhile, the needs and behavior patterns change continuously as academic research topics and methodologies display dynamic shifts over time. Consequently, keeping track of researchers’ evolving information needs and capturing their behavior in a timely manner are essential for information behavior research.

The purpose of this literature review is to highlight the importance of following the criteria and guidelines while conducting usability tests, investigate big data science web resources, the lack of usability research, and why it is necessary to conduct usability testing on all data science web resources. Through literature search, a good number of articles were found concerning the importance of the usability test and articles regarding the data science websites. Unfortunately, there is a gap in research that connects the two concepts together in conducting usability tests on data science websites. This led the researchers to attempt to fill the gap and argue for the need of conducting usability tests on data science websites.

Additionally this literature review mandates a necessity of user studies in the computational social science field which support the area effectively. Computational social
science is areas of scholarship dedicated to understanding, or improving the well-being of, human populations, using data at the level of (or informative about) individual people or group (King, 2014). In reviewing prior studies on social scientists’ information needs, it is clear that the emergence of computational social science will have an impact on the bigger picture of user study trends. It is important to understand current states of computational social science; examine efforts to support computational social scientists’ research; emphasize the urgency of information needs and behavior study for the computational social science field; and suggest what kinds of studies should be conducted.

4.2 Defining Big Data

As Adolph (2014) explains, “Big data - a composite term describing emerging technological capabilities in solving complex tasks - has been hailed by industry analysts, business strategists, and marketing pros as a new area for innovation, competition, and productivity” (p. 197). Originally defined by the “three Vs” – volume, variety, velocity (Gartner, 2011), and now including a “fourth V” – veracity, added by Zhang in 2013, big data is gathered through sensors, GPS, email, social media, medical devices, (Adolph, 2014; Zhang, 2013) and scientific tools, such as the Large Synoptic Survey Telescope (The Economist, 2010) to name only a few. Volume is compounded by variety: structured and unstructured text, still images and video, audio and streaming demand various modes of storing data, and the technology to maintain and access them. Velocity, the ever-increasing speed of the production of data, requires faster processing, analyzing, and computing technology (Genovese & Prentice, 2011; Zhang, 2013). To ensure veracity, analysts must have the skills to understand and assess the information, and they need those skills now (Davenport & Patil, 2012).
4.3 Importance of Usability Testing

In the Dudek, Mastora & Landooni (2006) study, it is suggested that conducting usability tests before and after the establishment of the website is very important. In addition, an evaluator of the website has to acquire in depth knowledge of the target system because the more information collected about the system, the more successful the evaluation will be. Meanwhile, with the increase of data technology, data science websites have increased rapidly. After conducting a small usability research project on the Institution for Quantitative Social Science (IQSS), a data science website by Harvard University, our results revealed the importance of performing further usability tests on social science data websites.

Usability refers to the extent to which a system, product or service can be used by users to achieve a specific task and goal with efficiency and satisfaction in a particular setting. Sindhuja & Dastider (2009) argued that the choice whether to use the system or not is affected by user judgment of two factors: 1) usefulness, the ability to use the system to improve user performance and 2) minimal effort that is required to operate the system.

4.4 New Paradigm in Social Science Research: Computational Social Science

Since around 2007, a number of studies have introduced the beginning of the new era in computational social science research (referred to by some scholars as “digital social science”). Researchers in this new method of social science use computational approaches to collect and analyze big data that reveal patterns of individual and group behavior (Lazer, 2009). Computational social science movements are found in diverse areas such as sociology, political science, economics, and geography, among others. Accordingly, necessities of analysis tools and methods were generated, and digital social research was born. Apparently, the new trend in
social science is recognized as a paradigm shift by many scholars. Computational social science is expected to exert its influence more and more by gaining a number of scholars and research groups.

At the same time, data science is a newly emerging field that includes a number of activities, such as data mining and data analysis. Data science is about the ability to easily cope with large amounts of data. Data science provides techniques that affect research in many fields such as social science. For example, Harvard Institute for Quantitative Social Science builds a powerful social science data infrastructure, which helps to grow a flourishing community of social scientists and apply the tools of social science such as big data, behavioral science, data analytics and statistics.

4.5 Necessity of User Studies in Computational Social Science Research

Although efforts to support computational social scientists have been done, it is hard to find user studies about them. Most of the related research pertains to the supports from developer-side or product-side. Studies about the needs and behavior have to be conducted to help social scientists adapt to the big changes. Two main purposive categories could be suggested in this research area: 1) user studies to develop effective tools including software for computational data scientists; 2) user studies to make accessing the tools more user-friendly.

4.6 Conclusion

Musson & Smith (2013) defined usability of data science websites as the ability to find relevant relationships in the data in order to make decisions regarding the quality and performance of the software. Unfortunately, there has been a lack of user experience studies of social science data websites. The researchers recommend that institutions conducting user studies
or usability testings internally, should initiate discussions accentuating the significance and necessity of the studies. Usability research is poised to make an impact on numerous tools being designed to handle the flood of data that will need to be stored, processed, analyzed and formulated into knowledge that will move our society into the future.

5. Method

5.1 Participants

The IQSS website is primarily for academic social science researchers. To find participants who resemble the target audience of the IQSS website, the researchers recruited graduate and doctoral students, professors, and researchers in the social science field. The following announcement was used for attracting participants:

“Are you a researcher or professor? Are you interested in learning more about products that can help your research process? If so, we are looking for you to participate in a usability session at the Simmons College School of Library and Information Science Usability Lab between October 20-22, 2014. Participants will receive an incentive. Please email moyland@simmons.edu for more information and to schedule a time.”

To have participants from various social science fields, the recruiting was done through multiple channels. The announcement has posted on IQSS Twitter and distributed in the social work graduate student lounge at Simmons College. In addition, the researchers sent emails to several masters and doctoral students studying social science, and advertised the need of participants during the usability class at Simmons College. Willing participants were found;
however, tight scheduling constraints made it impossible for some of them to join the study. At the conclusion of the recruitment period, four people were selected as participants.

5.2 Scenario

The participants were asked to pose as a sociology researcher at the newly established Institute of Social Research located in Boston. The establishment was only just being set up, so it was this researcher’s job to seek out proper software for research analytics and storing and preserving data. In the scenario we established that the researcher had just attended a Data & Statistics conference where they heard about the Data Science team at Harvard’s Institute for Quantitative Social Science.

5.3 Pre- and Post- Session Interview

Each session consisted of a pre- and post-session interview. The pre-session interview gathered demographic information such as age, academic status, familiarity with websites and technology in general, role at each participant’s respective academic institution, area of research, and if they had heard of IQSS before being recruited for the test. Questions were also posed regarding any software tools used in their research and where they find out about new tools.

The post-session interview consisted of likert scale ratings of the layout, navigation, and interface as well as each participant’s overall impression of the website. Further open-ended questions were asked about any confusion, difficulties, suggestions for improvement, what was pleasing as well as if the participant would visit the site in the future now that they were familiar with the site and tools offered. Interview questions can be found in Appendix B1.

5.4 Usability Sessions

Location & Configuration of Space
The usability sessions took place in the School of Library and Information Science Usability Lab at Simmons College which consists of a user room and an observer room. In the user room there is a computer, Logitech webcam with built in microphone and the Morae Recorder software. Morae Recorder captures all the desktop activities such as mouse clicks, mouse movement, and the participant’s facial expressions. The observer room is equipped with Morae Observer, where the technician can see the session in real time and take notes.

**Team Member Roles**

Sarah was the moderator. During the test session, Sarah introduced the whole session to the participant, sat with participant and led the conversation. She encouraged them to feel comfortable by explaining to them that the purpose of the test is not to test their ability or skills, but to test the website’s interface. She was also responsible for writing participant answers on the task sheet. Yeseul was the technician who was setting in the observer room, responsible for monitoring Morae software. Dorice was the note taker, recording observations as well as specific quotes from participants.

**Test Procedure**

Before testing sessions, we conducted a pilot test with a user. The pilot test was administered in order to find possible problems regarding equipments, tasks, and interviews for the testing. Several issues were found in the tasks, which the researchers revised after review by the site supervisor. For the official testing, participants were scheduled separately, with 60 minute time slots planned for each session. Sessions began with informal introductions of the testing team members and explanations of their respective roles. The participant was given a quick tour of the usability lab, at which time the equipment was described briefly. The moderator
explained that the website, not the participant, was being tested, in order to put them more at ease. Each participant was also asked for permission to record the session. Additionally, the participant was asked to speak their thought process out loud while moving through the tasks.

**Test Dates**

Four sessions were conducted during a one week period in October 2014. The sessions took place on October 20, 2014, from 4:00pm to 5:00pm; October 21, 2014, from 4:00pm to 5:00pm; October 21, 2014, from 5:15pm to 6:15pm; and October 24, 2014, from 3:00pm to 4:00pm. The pilot test took place before the sessions, on October 17, 2014, from 2:00pm to 3:00pm.

**5.5 Heuristic evaluation**

It is difficult to cover all aspects of the website in the usability testing tasks. To find possible problems which are not revealed in the usability sessions, heuristic evaluation is used additionally. Among many kinds of heuristics, the researchers decided to use 10 cognitive design principles developed by Gerhardt-Powals (1996). The heuristic is found in Appendix C1. Compared to other heuristics such as ISO dialogue heuristics and Nielsen’s 10 usability heuristics, Gerhardt-Powals’ heuristics have items focusing on informational websites such as the IQSS Data Science website. In particular, it has specific items directly related to terminology and information architecture, which are critical factors in the evaluand of the study. The heuristic evaluation is conducted by the three evaluators in the team. Each evaluator applied heuristics on the website to find problems for fifteen minutes, and combined the results after discussing each problem. Severity levels are rated in three scales: 1 (minor), 2 (moderate), and 3 (severe).
6. Measurements

Three factors of usability--effectiveness, efficiency, and satisfaction--are measured. For effectiveness, task success is used. Each task was coded as either 0 (success with ease), 1 (success with difficulty), or 2 (fail). If the participant was frustrated at least one time or had an incorrect answer in the process of getting to the right answer, it was coded as 1 (success with difficulty). For efficiency measurements, time on task, page on task, and paths for each task are collected. Click on task is also collected but excluded according to the site supervisor’s request. The site supervisor thought it is not very meaningful in the analysis; she rather wanted to look into page on task and its path. The data above was collected and analyzed in Morae software and Excel spreadsheets.

In the case of satisfaction, the note taker’s observation notes, post task survey, and post session surveys were used. The notes included observations of participants’ facial expressions, think aloud comments, body language, and other displays of emotion. The notes were used when reviewing and analyzing each participant’s video. The post-task survey consisted of one simple question asking perceived ease of use for each task, using a seven point Likert scale. This is useful for capturing participants’ immediate impression about each task. In the post-session survey, overall impressions and comments were collected.

7. Data Processing and Analysis

After four testing sessions, video recordings were reviewed, and data collected during the sessions were sorted by the three evaluators. Pre- and post-test survey results were coded in Excel spreadsheets. Among quantitative data from the tasks, task success and time on task were
collected analyzed, and visualized automatically by Morae Manager. Page on task were counted and analyzed manually as it was not collected in Morae Manager because of technical problems. Qualitative data from the tasks was reviewed with the videos and some quotes were extracted.

8. Results from Usability Testing

8.1 Participant’s background information

Following the recruiting process, four participants were chosen: one female researcher from the Trauma Center, one male doctoral student and two female masters students studying Library and Information Science at Simmons College. Two participants were in their 20s, one was in his 30s, and the other was in her 50s.

They all have various research backgrounds: Children and Young Adult Literature; Japanese and American history; neurofeedback; and information access/knowledge management/international academic collaboration. Three of them have previously used research tools, including Qualtrics, Camtasia, Matlab, EndNote, and OCLC Connection.

Regarding the IQSS Data Science website, one participant had visited the website once before, while the others had no experience with the website. Three of them had heard about it from a friend or in a class. Also, all participants said that they were skillful at using general websites. The background information above was derived from the pre-test interview and can be found in Appendix B2.

8.2 Usability testing results

Quantitative Results
In this section, results from four quantitative measurements are discussed, and problematic tasks are extracted.

*Task success (effectiveness)*: Task success rates varied among participants as shown in Appendix D1. Participant 3 failed in more tasks compared to the others, while participant 4 completed tasks more easily than the others. Regardless of differences among participants, it was possible to distinguish tasks which had low success rates (see Appendix D2). Tasks with a success rate below 75% are shown in Table 1. Tasks are ranked in the order of low success rate.

*Time on task and page on task (efficiency)*: Time on task and pages on task have similar patterns to each other, as found in Appendix D3 and D4. Average time on task for all tasks was 1.8, and the average page on task for all tasks was 3.25. Table 1 shows the tasks that participants spent more time than average to complete as well as more pages traveled through than average. Seven tasks had both time on task and page on task with an over-average value, and six of them have an over value on both time on task and page on task (2-b, 4-b, 2-a, 6-b, 7-a, and 1-b, in descending order of pages on task). This implies a high correlation between the two measurements. Also, these tasks show much more time and pages compared to time and pages for the most efficient way. For example, possible shortest path for task 2-b needs only one page (the answer is on the “Roadmap” page which is accessible from all pages in the website); however, the average of pages on task is 7.25, and the average of time is 3.75 minutes. Even if participants are novice users, the averages should be lower.

Task 2-c shows a high value only for time on task, not for page on task, while task 3-a is above the average only for page on task.
Perceived difficulty collected by post-task questions (satisfaction): Appendix D5 shows the range of the four participants’ answers for post-task questions. While the values have quite a wide range, it is possible to compare each task’s perceived difficulty using the average. The overall average of task averages is 3.82, and tasks above the average are shown in Table 1. Tasks are ordered from high scores to low scores.

Table 1. Ranking of tasks with low task success, high time on task, many pages on task, and high perceived difficulty. Red bolded text means tasks ranked in all four measurements; blue bolded text means tasks ranked in three measurements.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Effectiveness</th>
<th>Efficiency</th>
<th>Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Task Success (%)</td>
<td>Time on Task (min)</td>
<td>Page on Task (pages)</td>
</tr>
<tr>
<td>1</td>
<td>Task 2-b (0%)</td>
<td>Task 2-b (3.75)</td>
<td>Task 2-b (7.25)</td>
</tr>
<tr>
<td>2</td>
<td>Task 6-b</td>
<td>Task 1-b (2.76)</td>
<td>Task 4-b (4.75)</td>
</tr>
<tr>
<td>3</td>
<td>Task 2-a (50%, 25% difficulty)</td>
<td>Task 2-a (2.62)</td>
<td>Task 2-a</td>
</tr>
<tr>
<td>4</td>
<td>Task 4-b (2.24)</td>
<td>Task 3-a</td>
<td>Task 6-a</td>
</tr>
<tr>
<td>5</td>
<td>Task 2-c (2.15)</td>
<td>Task 6-b (4.25)</td>
<td>Task 7-b (4.5)</td>
</tr>
<tr>
<td>6</td>
<td>Task 6-b (1.16)</td>
<td>Task 7-a (4)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>-</td>
<td>Task 7-a (1.96)</td>
<td>Task 1-b (4)</td>
</tr>
</tbody>
</table>

Through quantitative results summarized in Table 1, task 2-b, task 6-b, and task 7-a were found as tasks showing major problems in terms of three usability evaluation elements—effectiveness, efficiency, and satisfaction. Task 2-c and task 4-b also proved to be problematic. The tasks and problems are explained in the interpretation of usability testing part.

Qualitative Results

Observations and Quotes: Observations and participants’ quotes during the testing are summarized in Table 2. All observations and quotes can be found in Appendix F.

Table 2. Summarization of observations and participants’ quotes by task

<table>
<thead>
<tr>
<th>Task</th>
<th>Observations</th>
<th>Participants’ Quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-a</td>
<td>Participants found the answer at a glance, but two participants failed as they thought “Lab” a product.</td>
<td>“It’s seven”, “I think the orange bar is for products”</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1-b</td>
<td>Two participants found answers on the homepage, while others looked through each product page.</td>
<td></td>
</tr>
<tr>
<td>2-a</td>
<td>Participant 3 had problem with finding an answer.</td>
<td></td>
</tr>
<tr>
<td>2-b</td>
<td>All participants failed with highest perceived difficulty, time, and pages.</td>
<td>“Where is it?”, “Why did they jump from Beta 4 to Beta 9?”</td>
</tr>
<tr>
<td></td>
<td>Participants are frustrated (participants tried to open PDF files, went back to homepage many times, tried search, closed the window!!!).</td>
<td></td>
</tr>
<tr>
<td>2-c</td>
<td>People abandoned the task quickly</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One person did not do the task (evaluators’ mistake)</td>
<td></td>
</tr>
<tr>
<td>3-a</td>
<td>Two participants tried to find a “for help” menu instead of going to each product page.</td>
<td>“It could use a ‘Help’ tab on the main page?”</td>
</tr>
<tr>
<td>3-b</td>
<td></td>
<td>“It is annoying to have to click on each page to find out if there was support.”</td>
</tr>
<tr>
<td>4-a</td>
<td>People found the answer very easily.</td>
<td>“The color-coded headings on the Team page are helpful.”</td>
</tr>
<tr>
<td>4-b</td>
<td>Secondary highest pages on task, somewhat long time on task.</td>
<td>“The term “map partner” is kind of confusing.”</td>
</tr>
<tr>
<td>5</td>
<td>All participants found it with by chance.</td>
<td></td>
</tr>
<tr>
<td>6-a</td>
<td>Easy for all participants.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>All went to different pages: blog, search…</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One Participant used a search box.</td>
<td></td>
</tr>
<tr>
<td>6-b</td>
<td>Two participants couldn’t think about “Roadmap”.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Two participants annoyed about identifying each column in “Roadmap” page.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The search function was used.</td>
<td></td>
</tr>
<tr>
<td>7-a</td>
<td>Participants were confused.</td>
<td>“Why is this under ‘Lab’? It should be under ‘Job/Opportunities’.”</td>
</tr>
<tr>
<td>7-b</td>
<td>If a participant find an answer for 7-a, they found an answer for 7-b.</td>
<td></td>
</tr>
</tbody>
</table>

*Paths:* The four participants’ paths for each task are found in Appendix E. The site supervisor requested the team to collect this data. The paths are partly used for interpretation of the results.

8.3 Post-test Interview Results

Participants' overall evaluation of the website is positive rather than negative. In a seven Likert points scale, ease of finding the product presented has a 5 satisfaction rating, navigation has a 4.9 rating, and organization of the interface has a 4.75 rating. Confidence while using the
website and comfort level of the overall interface show scores of 4 or above. Comments for open ended questions support the positive impression of the website. However, the participants were not necessarily willing to use the website in the future. This can be attributed to the fact that they don’t use these types of tools regularly on the job. In comments, improvements including about several terminologies, internship menu, homepage, header part are suggested. Details can be found in Appendix B3.

8.4 Interpretation of usability testing

After reviewing the 4 sessions and after analyzing the data collected through the pre- and post-survey, many critical issues were revealed that needed improvement on the IQSS Data Science website, such as terminology. Moreover, during the usability testing, the team recognized that the participants were overwhelmed with the amount of content on the homepage. In the post-survey, participants recommended decreasing the amount of the contents from the homepage in order to make it more clear.

During the tasks all of the participants gave the same comments about the number of products in task 1. They felt that the term LAB, which is located in the toolbar at the top of the page along with the products, should be removed. In task 2b, the term “Roadmap” was very difficult for participants to understand. They did not realize that this term refers to the project’s timeline. Therefore, all participants failed this task, and it is considered as the highest perceived difficulty. It took them the most time to answer, and it was the longest path for all participants. They got frustrated and tried to open the pdf file, went back to the homepage, tried the search function, closed the window, and continued searching everywhere without an answer. Task 2c
pertained to hosting a research data repository and how to download the software for that purpose. Unfortunately, only one participant found it, while others abandoned it rapidly.

Task 4b asked the participants to find out about the work the Data Science team is doing with a map partner. This page was considered as the second highest pages on task. The participants struggled to complete this task. Difficulties were encountered, but partly because of our wording of the task. When participants landed on this page, they were unsure of the differentiation of the terms "collaborations" and "partners". Task 6b also caused some difficulties. Participants were asked to find which product was not being worked on during November. Two participants answered it and two failed. They used the search box as a final option before they gave up.

In task 7a, the participants were asked to find if there were paid internships at IQSS Data Science. Two participants were confused in completing this task and one participant failed because the information about the internship was in the Lab section, which did not make sense to the participants. They commented that the internship information should be under a Job/Opportunities section. Even the participant who completed the task took a long time to find the information. Ultimately, all participants thought it was completely wrong to put internship information under LAB.

9. Results from Heuristic Evaluation

Heuristic evaluation found three severe problems, eight moderate problems, and six minor problems. There is some overlap with some problems found in usability sessions, while others are newly found through the heuristic evaluation.
The most severe problems are found in the menu. A menu label for "Roadmap" is difficult to understand and uncertain. It violates rules regarding uncertainty (2) and names (5) in the heuristics evaluation. Another severe problem is the location of the "Lab" menu. A distinguishing orange bar across the top third of the page displays six software tools and "Lab" as menu options. All seven menus look the same, although "Lab" is not one of the software tools. This is a problem with data grouping (6). All problems, including moderate and minor problems, are found in Appendix C2.

10. Problems Identified (from Usability Testing and Heuristic Evaluation)

Table 3 summarizes problems identified through the user testing and heuristic evaluation in the study. Fix priority, problem type, location of each problem, and the methodology used to determine the problems are demonstrated. Fix priorities are assigned with considerations of severity in heuristic, results from user testing including number of users who had difficulty with the problem, the evaluators’ opinion, and possible effects to users. Problems found in user testing are described in detail—with user testing result--below.

Problem codes are as follows, and A/B/C/D is marked in the table as the following: A. Terminology or Label; B. Information or Contents Organization; C. Amount of Information; D. Interface Design.

Table 3. Problems identified from user testing and heuristic evaluation in order of fix priority. (UT: user testing, H: heuristics)

<table>
<thead>
<tr>
<th>Priority</th>
<th>Code</th>
<th>Location</th>
<th>Problems Identified</th>
<th>UT</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B</td>
<td>Menu</td>
<td>&quot;Lab&quot; seems to be a product on the menu.</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>Menu</td>
<td>Terminology of &quot;Roadmap&quot; is difficult for users.</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>B</td>
<td>Lab, Team</td>
<td>It is difficult to know differences between “Lab” and “Team” at by menu label. Two menus need to be more systemically organized.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>C</td>
<td>Mainpage</td>
<td>There is too much information on the first page, and it can be overwhelming to users.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>B</td>
<td>Support</td>
<td>“Support” menu is not offered on all product pages, and there is no integral access point on the homepage, regardless of its importance in the IQSS Data Science website.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>Software Pages</td>
<td>Texts describing products on each product’s page are too long and wordy.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>Menu</td>
<td>It is difficult to predict contents of “Roadmap” menu with its label; an icon with graphical metaphors could help interpretation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>D</td>
<td>Overall</td>
<td>IQSS logo on the right side is too big, so the website looks like IQSS website, not the Data Science website.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>Software (Zelig)</td>
<td>URL in the “Zelig” page is unfriendly and different from URL of the target page.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>Lab</td>
<td>Contents for “Lab” menu are different from expectations.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>Lab</td>
<td>There are too many texts that it is difficult to grasp contents at a glance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>Roadmap</td>
<td>Design function of “Roadmap” page</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>Overall</td>
<td>It is difficult to find information about job and internship.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>Search</td>
<td>The icon ‘►’ marking activation of the “Sort By” options which is shown on the right side menu could be misunderstood that it has more functions than marking the activation of the option.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>Search</td>
<td>There is a hierarchy (year, month, and data) in &quot;Filter by Post Date&quot; options, but three classes look same, and the function is not intuitive to be recognized.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>D</td>
<td>Search</td>
<td>“Quick Links” on the right side menu of each software page is not clickable; but it looks same with clickable menus and mouse rollover effect is applied.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>D</td>
<td>Search</td>
<td>If search box has a predictive text input function, it would decrease workload of users who use the search function.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>A</td>
<td>Collaboration</td>
<td>Relationship between “Collaborations” and &quot;Partners&quot; is not clear for some users.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
11. Recommendations

Based on the problems found through usability sessions and heuristic evaluation, the researchers suggest the following recommendations for problems which are considered to be most important to be discussed in detail. Recommendations are sorted by problem types. See Appendix G1, G2, and G3 for screen shots from the website.

11.1 Terminology/Label

*Use more intuitive terminology than "Roadmap"

Roadmap may be a common term to developers and project managers, but it is not necessarily common to novice researchers who might not have experience in these areas. Perhaps a more user friendly choice would be a word such as “project plan”, “project time plan”, “project schedule”, “planning”, or “project calendar”.

*Correct URL on “Zelig” page

The URL should be revised to “zeligproject.org”, so that it would align with the rest of the product URLs.

*Clarify terms "Collaborations" and "Partners"

“Collaborations” was another confusing term for all of the participants in task 4-b, which required them to find a map partner. A possible solution would be to add “& Partners” in the menu labeling, which would make this navigation label more clear. If the user is not deeply involved in some aspect of these particular initiatives, the meaning of this link may not be clear.

11.2 Information/Content Organization

*Differentiate "Lab" label on the menu*
The usability research team recommends that the Lab link should be featured in a
different manner. This would differentiate that it is a “product” or “tool” of a very different
nature than the software tools that make up the main features of the website. The Lab is an
innovative place that exemplifies what IQSS is all about. It is the Data Science team’s live
“ongoing collaborative workshop” offering real-time experience working with the Data Science
software development team. It offers the opportunity for scholars and students to work in a cross-
disciplinary environment.

**Realign the placement of the “Lab” information**

“Lab” is actually a part of the Data Science “Team”, which has its own link in the menu
at the top right on the page. “Lab” could be a sub menu under the “Team” menu or the contents
could be included on the “Team” page.

**Relocate the terminology of Job/Internship information**

The term “Internship” which is located under the “Lab” section was an obstacle for all
participants. It is better to add a separate section on the menu about Jobs/Opportunities and
include the internship information and other information that belongs in Jobs/Opportunities in
this section.

**Offer access to “Support” from all pages**

Since the primary purpose of the website is providing open source software, the “Support”
menu is very important. However, the access point is not offered consistently on each software
page. Even if it is offered on every software page, it is not found easily. One participant tried to
find the “Help” menu on the bottom of the website. It could be a good solution since it is a
familiar location to many users.
11.3 Amount of Information

Condense the text on the homepage

The homepage is a bit too text-heavy. Perhaps tightening up the description for each product, and putting borders around each description to create a more organized look.

Visualize information on each product page and “Lab” page

Instead of long and tedious texts, a more efficient way of delivering the information is needed. These suggestions should be considered: more graphical items; varying text sizes and colors; and having efficient headings for each section.

11.4 Interface Design

Add functionality to row titles on “Roadmap” page

Participants experienced inconveniences and felt annoyed when exploring information in the Roadmap menu. The page has a vertically long table; however, the title row for the whole table is located only at the top. Thus, users need to go up and down many times to check which column is for which software. We suggest adopting a function which would freeze the title row at the top of the internet browser. This would be similar to the freeze option that is applied to the black line for “Harvard University” on the roadmap page. Another alternative would be offering a “To the Top” button at the bottom right corner.

Revise various design problems on the search results page and software pages

On the search results page, in the “Sort By” section, the icon "▲" for marking an activated item needs to be replaced with a different icon that is more clear or just bolded texts. In “Filter by Post Date” options, icons such as “▶” need to be added in front of each year which shows that it is clickable and expandable to reveal months under each year.
On each software page, the grey background and mouse rollover effect for "Quick Links" need to be removed to differentiate from clickable menus. Bolding the “Quick Links” texts will make it clear that it is a title for other links underneath. Removing the “Quick Links” title could be considered instead, because it is neither informative nor necessary.

**Enhance internal search box function**

Predictive text input function has become popular, and some users might expect this function in the IQSS website. Although it is not an essential function for an informational website, it is necessary for search engines. This intuitive function will create a smarter and more attractive for users.

**12. Conclusion**

As presented in the literature review, it is essential and helpful to conduct usability testing for improving the efficiency of the website. Such a usability study should be conducted in multiple iterations for continued improvements. This study conducted usability testing and heuristic evaluation to find problems in the IQSS Data Science website. As a result, eighteen problems were found and have been divided into four problem types. Additionally, recommendations for the main problems are presented. The problems identified and suggested recommendations will be conveyed to the IQSS Data Science site supervisor who will hopefully use the results as a guideline for the future re-design and implementation of the website.
13. Bibliography


Data, data everywhere. The Economist. 25 February 2010.


Appendix A. Scenario & Task

Usability Testing of Harvard IQSS Data Science

Thank you for your participation. For this part of the study, you will use the Harvard IQSS Data Science website for the following scenario. There is no right or wrong answers, and we are only interested in learning how you would use the IQSS Data Science website for tasks similar to those outlined below. We are not testing your knowledge or skills in using the website.

Scenario:

You are a sociology researcher at the Institute of Social Research located in Boston. Since the institution was established just 2 weeks ago, there are lots of things to set up. One of important thing is finding proper software for research analytics and storing and preserving data. The necessity led you to Data & Statistics Annual Conference to get information. Many kinds of software were introduced there, and you were especially interested in products of Harvard IQSS Data Science. After returning from the conference, you are looking at the Harvard IQSS Data Science website to find out more about the software products that are available.

Tasks:

1. Many software products were introduced by companies at the conference but you remember IQSS. You want to remind yourself what kinds of tools IQSS have and what are the names.
   a. How many products is Data Science offering? ______________
   b. _______________ is for statistical analysis using many specific methods, _______________ is for text clustering, _______________ is for sharing sensitive data, and _______________ allows data exploration and analysis by integrating other Data Science products.

2. Having generally identified IQSS Data Science products, you remember that the first step for setting up the Institute of Social Research lab is hosting your own research data repository. Now you are going to find a proper product for your needs.
   a. What is the name of the product you need? _______________
   b. When will beta 9 for Dataverse planned to be released?
      (MM/DD/YYYY) _______________
   c. How would you download the software? _______________

3. Your team leader Lisa is also interested in IQSS Data Science products, specifically how to report bugs and software problems. She’s asked you to find out and report back to her the process.
   a. How can you report bugs in products to IQSS Data Science?
   b. Is it possible to report bugs for all products? (Y/N) __________
4. You believe now that you have a good understanding of the tools IQSS provides on its Data Science website. However, you do not have enough knowledge about IQSS Data Science itself. Now you are exploring the website to learn more about it.
   a. How many employees are working as software developer? _______
   b. How would you learn more about the work Data Science is doing with a map partner? _______

5. How would you determine what institute at Harvard, IQSS Data Science is part of? 

6. Now that you have an overall picture of IQSS Data Science you want to know more about what they have done recently.
   a. How many developers from IQSS Data Science presented at the JavaOne Annual Conference? _______
   b. Which product is the IQSS Data Science team not working on during November 2014? _______________

7. Your best friend Tim asked you if there is any available internship position in IQSS Data Science.
   a. Is it possible to find a paid internship at IQSS Data Science? (Y/N) _______
   b. You are going to give Tim an email address of a person in charge of recruiting internship positions. What is the email address? 

________________________________________________________________________
Appendix B1. Pre- and Post-test Interviews

I. Pre-Session Survey Script

Thank you for your willingness to participate in this study. We are interested in learning if Institute for Quantitative Social Science, IQSS, Data Science website is properly designed for researchers who want to get information about research software. I will ask several questions about you, your use experience and thoughts about the website.

1. I am: _____ 19 or under _____ 20 - 29 _____ 30 - 39
   _____ 40 - 49 _____ 50 + _____ rather not say.

2. What is your academic status?
   _____ Masters Student _____ PhD student _____ Post PhD
   _____ Asst. Professor _____ Assoc. Professor _____ Full Professor
   _____ Other ( )

3. How much are you familiar with using websites? (1-7)

4. What is your role in your institution?

5. How long have you been at your institution?

6. What is your specialized area of research?

7. Have you heard of the Data Science team at IQSS or IQSS?

8. Today, we are going to test the Harvard IQSS Data Science Website. Have you visited the IQSS Data Science Website before?
   a. If you have visited the website,
      - How did you hear about the website?
      - How many times have you visited the website?
      - For what did you visit the website?
   
   b. If you haven’t used the website,
- Did you hear about the Data Science website before today? If so, how did you hear about it?

9. Do you use any software for your research? If yes,
   
a. What software do you use? (e.g., statistical software, data repository tool, data sharing tool, text analysis tool)
   
b. How skillful are you in using software? On a scale of 1 to 7 where 7 means very proficient and 1 means not proficient at all, how would you rate yourself?
   
c. If you use more than one type of research software, which do you utilize the most? Why?

10. Where and how do you typically get information about research tools?

11. Do you have any difficulties using the tools or websites you mentioned above?

II. Post Session Interview Script

Thank you so much for your time. We are interested about your thoughts regarding using the Data Science at IQSS Website.

1. How easily did you find the products that are presented on the website?
   Very difficult 1 2 3 4 5 6 7 Very easy

2. How satisfied are you with the overall navigation of the website?
   Not satisfied at all 1 2 3 4 5 6 7 Very satisfied

3. Did you find the various products and menu options in the interface of the website are well organized?
   Not at all organized 1 2 3 4 5 6 7 Very organized
4. How likely is it that you will use the Website in the future?
   Very unlikely 1 2 3 4 5 6 7 Very likely

5. How confident did you feel while using the website?
   Not at all confident 1 2 3 4 5 6 7 Very confident

6. How comfortable were you with the overall interface of the website?
   Not at all comfortable 1 2 3 4 5 6 7 Very comfortable

7. Did you find any confusion while searching in the website? If so, what is the specific part that was confusing you?

8. What specific improvement could be made to IQSS to ease the search for you tasks?

9. What do you recommend for the overall interface of the website?

10. Would you visit the website again for your research after participating in this test?

11. Which terms used on the website were you not familiar with or caused confusion?

12. What is your overall impression about the site?
### Appendix B2. Pre-test Interview Coding Sheet

<table>
<thead>
<tr>
<th></th>
<th>Participant 1</th>
<th>Participant 2</th>
<th>Participant 3</th>
<th>Participant 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>20-29</td>
<td>20-29</td>
<td>50+</td>
<td>30-39</td>
</tr>
<tr>
<td><strong>Academic status</strong></td>
<td>Masters</td>
<td>Master</td>
<td>Post PhD</td>
<td>Ph.D. student</td>
</tr>
<tr>
<td><strong>Familiarity using websites</strong></td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td><strong>Role at institution/job??</strong></td>
<td>Student worker in Beatly Library</td>
<td>Archive Assistant at Northeastern University</td>
<td>Child Research Member at GRI</td>
<td>Senior Serials Asst. at Sawyer Library-Suffolk Univ.</td>
</tr>
<tr>
<td><strong>How long at institution/job??</strong></td>
<td>6 Years</td>
<td>6 Months</td>
<td>6 Years</td>
<td>2 years</td>
</tr>
<tr>
<td><strong>Specialized area of research</strong></td>
<td>Children and Young Adult Literature</td>
<td>Japanese, American history</td>
<td>Neuro Feedback</td>
<td>Information access/knowledge mgmt./academic collaboration (international)</td>
</tr>
<tr>
<td><strong>Heard of Data Science before?</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Not before Usability class</td>
</tr>
<tr>
<td>~ If YES: How did you hear about it?</td>
<td>One of the team member of IQSS</td>
<td>From Friend</td>
<td>X</td>
<td>class</td>
</tr>
<tr>
<td>~ If YES: How many times visited the site?</td>
<td>X</td>
<td>Once</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>~ If YES: For what did you visit?</td>
<td>X</td>
<td>Directed to visit</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Do you use software for your research?</strong></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>~ If YES: What software?</td>
<td>Qualtrics-Camtasia</td>
<td>X</td>
<td>Matlab</td>
<td>EndNote (for citation mgmt.), OCLC Connection (for cataloging &amp; records mgmt.)</td>
</tr>
<tr>
<td>~ If YES: How skillful are you with it?</td>
<td>4</td>
<td>X</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>~If YES: If you use more than one, which do you use most? Why?</td>
<td>Camtasia</td>
<td>X</td>
<td>X</td>
<td>OCLC because it’s a big part of the job.</td>
</tr>
<tr>
<td><strong>Where/how do you get information about research tools?</strong></td>
<td>Colleagues</td>
<td>X</td>
<td>Colleagues</td>
<td>IT white papers; friends/colleagues/boss/ASSIST</td>
</tr>
<tr>
<td><strong>Any difficulties using tools mentioned?</strong></td>
<td>No</td>
<td>X</td>
<td>YES</td>
<td>Initially, but not anymore.</td>
</tr>
</tbody>
</table>
## Appendix B3. Post-test Interview Coding Sheet

<table>
<thead>
<tr>
<th></th>
<th>Participant1</th>
<th>Participant2</th>
<th>Participant3</th>
<th>Participant4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easily finding the products presented</td>
<td>3</td>
<td>7</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Satisfaction with overall navigation</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>5.5</td>
</tr>
<tr>
<td>Products &amp; menu options in the interface are well organized</td>
<td>5</td>
<td>6</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Use the website in the future</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Confidence while using the website</td>
<td>5</td>
<td>6</td>
<td>2</td>
<td>4 (at first) 5 (by the end)</td>
</tr>
<tr>
<td>Comfort level of the overall interface</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Any confusion while searching in the website</td>
<td>Internship part and map partner</td>
<td>The location of the tool bar</td>
<td>Task6 (Presentation, Blog section)</td>
<td>2b Could not find Beta 9</td>
</tr>
<tr>
<td>Improvement could be made to IQSS</td>
<td>Internship information box added next to the team tool bar</td>
<td>Spend more effort on the homepage</td>
<td>Organize the homepage because too much writings.</td>
<td>Roadmap renamed; nav. link for jobs/opps/internships</td>
</tr>
<tr>
<td>Recommendation for overall interface</td>
<td>Add search guide (Site Map)</td>
<td>No comment</td>
<td>1. Take out twitter section from the homepage. 2.Make it more traditional 3.Add small explanation under each product instead of listing them on the homepage</td>
<td>Make Data Science and IQSS header in hierarchical format to clearly represent relationship</td>
</tr>
<tr>
<td>Visit the website again for personal research after this test</td>
<td>Yes</td>
<td>If it is relevant</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Confusion terms in the websites</td>
<td>Roadmap</td>
<td>No confusion</td>
<td>Description of products, Collaboration, presentation.</td>
<td>Roadmap</td>
</tr>
<tr>
<td>Overall Impression</td>
<td></td>
<td></td>
<td>Very good; products featured right up front; other options could be more prominent, although I understand they are auxiliary; not too busy in design which is nice.</td>
<td></td>
</tr>
</tbody>
</table>
### Appendix C1. Heuristics Principles (Gerhardt-Powals, 1996)

<table>
<thead>
<tr>
<th>Heuristics</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Automate unwanted workload</td>
<td>Eliminate mental calculations, estimations, comparisons, and unnecessary thinking, to free cognitive resources for high-level tasks</td>
</tr>
<tr>
<td>2 Reduce uncertainty</td>
<td>Display data in a manner that is clear and obvious to reduce decision time and error</td>
</tr>
<tr>
<td>3 Fuse Data</td>
<td>Bring together lower level data into a higher-level summation to reduce cognitive load</td>
</tr>
<tr>
<td>4 Present new information with meaningful aids to interpretation</td>
<td>New information should be presented within familiar frameworks (e.g., schemas, metaphors, everyday terms) so that information is easier to absorb</td>
</tr>
<tr>
<td>5 Use names that are conceptually related to function</td>
<td>Display names and labels should be context-dependent, which will improve recall and recognition.</td>
</tr>
<tr>
<td>6 Group data in consistently, meaningful ways</td>
<td>Within a screen, data should be logically grouped. Across screens it should be consistently grouped. This will decrease information search time</td>
</tr>
<tr>
<td>7 Limit data driven tasks</td>
<td>Use color and graphics, for example, to reduce the time spent assimilating raw data</td>
</tr>
<tr>
<td>8 Include in the displays only that information needed by the operator at a given time</td>
<td>Exclude extraneous information that is not relevant to current tasks so that the user can focus attention on critical data</td>
</tr>
<tr>
<td>9 Provide multiple coding of data</td>
<td>The system should provide data in varying formats and/or levels of details in order to promote cognitive flexibility and satisfy user preferences</td>
</tr>
<tr>
<td>10 Practice judicious redundancy</td>
<td>In order to be consistent, it is sometimes necessary to include more information than may be needed at a given time</td>
</tr>
</tbody>
</table>
## Appendix C2. Evaluation Results

Usability Heuristic Used: Gerhardt-Powals (1996) 10 cognitive design principles  
Severity Levels: 3pt (3: severe, 2: moderate, 1:minor)

<table>
<thead>
<tr>
<th>Heuristic</th>
<th>Problems Identified</th>
<th>Severity Rating</th>
</tr>
</thead>
</table>
| 1         | - If search box has a predictive text input function, it would decrease workload of users who use the search function.  
- URL in the “Zelig” page is unfriendly and different from URL of the target page. It should be revised to “zeligproject.org”.                                       | 1               |
| 2         | - “Roadmap” menu label is not very obvious.  
- IQSS logo on the right side is too big, so the website looks like IQSS website, not the Data Science website.  
- On search result page, an icon “▲” marking activation of the “Sort By” options which is shown on the right side menu could be misunderstood that it has more functions than marking the activation of the option.  
- On search result page, there is a hierarchy (year, month, and data) in “Filter by Post Date” options, but three classes look same, and the function is not intuitive to be recognized.  
- “Quick Links” on the right side menu of each software page is not clickable; but it looks same with clickable menus and mouse rollover effect is applied.             | 3 2 1 2 1       |
| 3         | - “Lab” and “Team” menus need to be more systemically organized. They are closely related in terms of contents and menu label, but offered as separate menus and the relation between two menus are not clear. | 2               |
| 4         | - It is difficult to predict contents of “Roadmap” menu with its label; an icon with graphical metaphors could help interpretation.                                                                                 | 1               |
| 5         | - “Roadmap” menu label is not easy to understand for users.  
- “Lab” menu’s contents are different from expectations.  
- On search result page, “Filter by Taxonomy” label needs to be more specific.                                                                          | 3 2 2           |
| 6         | - “Lab” menu on the orange bar should be differentiated from other software menu. It looks like a kind of software.                                                                                               | 3               |
| 7         | - Text describing products on each product page is too long and wordy. Colors and graphics could be used to make descriptions friendly and understandable.                                                             | 1               |
| 8         | - There is too much information on the “Homepage” and it could make users overwhelmed.  
- When clicking “Search” button without putting keywords in or clicking “Search” breadcrumb on search result pages, the result page shows not relevant contents.               | 1 2             |
| 9         | N/A                                                                                                                                                                                                                   | 0               |
| 10        | - “Support” menu is not offered on all product pages, and there is no integral access point on the homepage, regardless of its importance in the IQSS Data Science website.                                       | 2               |
Appendix D1. Task Success (by participant)

Appendix D2. Task Success (by task)
Appendix D3. Average Time on Task (by task)

Appendix D4. Average Pages on Task (by task)
Appendix D5. Average and Range of Perceived Difficulty (by task)
Appendix E. Path by Task

* “P” in the table stands for “participant”.
* Each task’s path started on the last page of the former task (e.g., P1 started task 2-b on the “Dataverse” page, which is the last page of task 2-a).

<table>
<thead>
<tr>
<th>1-a</th>
<th>P1 homepage</th>
<th>P2 homepage</th>
<th>P3 homepage</th>
<th>P4 Zelig</th>
<th>Dataverse</th>
<th>TwoRavens</th>
<th>DataTagss</th>
<th>Consilience</th>
<th>RBuild</th>
<th>Dataverse</th>
<th>lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-b</td>
<td>P1 homepage</td>
<td>P2 Zelig</td>
<td>Consilience</td>
<td>Dataverse</td>
<td>DataTagss</td>
<td>RBuild</td>
<td>Dataverse</td>
<td>TwoRavens</td>
<td>P3 homepage</td>
<td>P4 Zelig</td>
<td>Consilience</td>
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<td>2-a</td>
<td>P1 homepage</td>
<td>P2 TwoRavens</td>
<td>P3 homepage</td>
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<td>homepage</td>
<td>Consilience</td>
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<td>RBuild</td>
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<td>P4 RBuild</td>
<td>Consilience</td>
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<tr>
<td>2-b</td>
<td>P1 Dataverse</td>
<td>P2 Dataverse</td>
<td>P3 Dataverse</td>
<td>Dataverse</td>
<td>pdf file</td>
<td>close the browser</td>
<td>search</td>
<td>blog</td>
<td>Dataverse</td>
<td>P4 Dataverse</td>
<td>4.0 beta</td>
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<tr>
<td>2-c</td>
<td>P1 -</td>
<td>P2 community</td>
<td>Github</td>
<td>P3 -</td>
<td>P4 google group</td>
<td>support in Zelig</td>
<td>search box</td>
<td>homepage</td>
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<td>lab</td>
<td>Merce Crosas profile page</td>
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</table>
### Appendix F. Observation and Participant’s Quotes

<table>
<thead>
<tr>
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<th>1-a</th>
<th>1-b</th>
<th>2-a</th>
<th>2-b</th>
<th>2-c</th>
<th>3-a</th>
<th>3-b</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P1</strong></td>
<td>Logical, calm demeanor; took time to read descriptions on homepage</td>
<td>Search for key words from questions in the blurbs on homepage to determine answer</td>
<td>Could not find after searching where it seemed obvious; used site search box; tipped head, &quot;thinking mode&quot;</td>
<td>Remained calm while reading; leaned forward searching for term &quot;Beta 9&quot;; asked for clarification of term; used search box; some prompts(??) from me</td>
<td>SKIPPED BECAUSE I THOUGHT IT WAS CONTINGENT ON 2B</td>
<td>Looked for a help box on bottom of page; used search box to find help &amp; support and realized it was on Consilience page so checked each tool to determine the answer.</td>
<td>Answered quickly because of what she found through her search for answer to 3a.</td>
</tr>
<tr>
<td><strong>P1’s Quotes</strong></td>
<td>“I like the organized layout of the homepage overview.”</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>P2</strong></td>
<td>Participant was calm and started by opening all product pages in separate tabs to read more easily. Facial expression was calm.</td>
<td>Search took longer because she took time to read about each tool carefully. Remained calm and facial expression was “thinking mode.”</td>
<td>Found Dataverse quickly and calmly.</td>
<td>Could not find Beta 9, but was not stressed out.</td>
<td>Found where to download software</td>
<td>Found Community Support quickly to complete the task.</td>
<td>Completed this task quickly. Having opened all tabs from the start she could move easily between pages to complete tasks.</td>
</tr>
<tr>
<td><strong>P2’s Quotes</strong></td>
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</tr>
<tr>
<td><strong>P3</strong></td>
<td>After reviewing the homepage briefly, she assumed all tabs in orange navigation bar were tools, and included the Lab as one of the tools.</td>
<td>Leaning in to read with deep concentration.</td>
<td>Asked for clarification of the term &quot;repository&quot; (more of a language issue; ESL). Could not find after searching each tool web page. She used the back button to get back to homepage each time. She was very intent; hand on chin thinking mode.</td>
<td>Used search box, found Beta 4 but not Beta 9. Next she tried Ctrl F. Was a little frustrated, but searched with determination.</td>
<td>Continued to search with determination but couldn’t find out how to download the software.</td>
<td>Went to DataVerse page and found the &quot;contact us&quot; and then found &quot;Community &amp; Support.”</td>
<td>Determined the answer by checking each tool page.</td>
</tr>
</tbody>
</table>
| P3’s Quotes | "Too much text makes it confusing."  
"Why does Twitter need to be here?"  
"Not well organized." | "Why did they jump from Beta 4 to Beta 9?" | Mentioned that it was annoying to have to click on each tool to find out if there was support. |
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>P4</td>
<td>Leaning forward to read carefully. He was calm and read about each tool to become familiar with the tools. Used Ctrl F to find the term &quot;sensitive data.&quot; Found answer pretty quickly.</td>
<td>Found tools needed relatively easily, but didn’t find correct tool for text clustering, so task was not complete.</td>
<td>Found the correct answer after reviewing tools from right to left.</td>
</tr>
<tr>
<td></td>
<td>Searched with determination. Used Ctrl F but still could not find it. He remained calm but finally seemed at a loss and gave up.</td>
<td>Did not find where to download software.</td>
<td>He found how to report bugs easily.</td>
</tr>
<tr>
<td></td>
<td>Did not find where to download software.</td>
<td>Used search box and found &quot;Community &amp; support&quot; and realized he was on Zelig page so then he checked other tool pages and completed task.</td>
<td></td>
</tr>
<tr>
<td>P4’s Quotes</td>
<td>&quot;I like the orange tool bar. It draws the eye right to it.&quot;</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>4-a</td>
<td>4-b</td>
<td>5</td>
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<tr>
<td>---</td>
<td>---------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------</td>
</tr>
<tr>
<td>P1</td>
<td>Explained that &quot;Team&quot; or &quot;Collaboration&quot; seemed like the most likely place to find answer. Tried &quot;Collaboration&quot; first and quickly determined that &quot;Team&quot; was the place.</td>
<td>After searching a bit, she seemed to need clarification of the term &quot;map partner&quot;. I prompted her that she had briefly explored &quot;Collaborations&quot; in the previous task.</td>
<td>Found the IQSS page quickly but did not realize it was the answer until we affirmed.</td>
</tr>
<tr>
<td>P1's Quotes</td>
<td>&quot;The color-coded headings on the Team page are helpful.&quot;</td>
<td>&quot;The term &quot;map partner&quot; is kind of confusing.&quot;</td>
<td></td>
</tr>
<tr>
<td>P2</td>
<td>Again, she completed task quickly and calmly.</td>
<td>Completed quickly and calmly.</td>
<td>Quickly determined Data Science part of IQSS.</td>
</tr>
<tr>
<td>P2's Quotes</td>
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<tr>
<td>P3</td>
<td>Completed task quickly.</td>
<td></td>
<td>Found without realizing right away, but was able to complete the task.</td>
</tr>
</tbody>
</table>

P1's Quotes:
- "The color-coded headings on the Team page are helpful."  
- "The term "map partner" is kind of confusing."  

P2's Quotes:
- "It seems this information would be on the IQSS website."  

P3's Quotes:
- Found without realizing right away, but was able to complete the task.
| P3’s Quotes | but didn’t find it. | | | | "Why is this under "Lab"? It should be under "Job/Opportunities." |
| --- | --- | --- | --- | --- |
| P4 | Recognized this from previous review of tools, so this was an easy task for him. | Used search box, wanted to go to Google but we asked him not to. Then he found it but didn’t realize it at first. | Went to "About us", then "Director" of IQSS, then "institute" and completed task. | Completed task easily. | Became a little frustrated but was always calm. Then he remembered that he had seen a map of some sort and completed task. | Completed relatively easily. | Completed easily. |
| P4’s Quotes | | | | | "I think of a site map when I see the term "Roadmap." |
Appendix G1. Homepage

Data Science
Research Frameworks for Data-Intensive Science, Analytical Tools and Data Stewardship

About Us
Data Science at IQSS combines expertise in software engineering, statistical innovation and data curation. Meet our team.

Current Efforts
Reproducible and Reusable Science
Connecting research results to the underlying data and analysis is central to validate and extend scientific discoveries. Our tools encourage open data and clarity about methods, when possible, and promote and enable data citation.

Software Projects
Zelig
Everyone’s Statistical Software
Zelig: Everyone’s Statistical Software allows a large body of different statistical models to be

Data Science Blog
A Bridge from Publishing Words to Publishing Data
Aiding Reproducible Research By Adding Provenance in Data Citations
Try Out Single Sign-On with Shibboleth 4.0
Appendix G2. Software Page

Zelig
Dataverse
TwoRavens
DataTags
Consilience
RBuild
Lab

HOME /
About Zelig

P.I.: Gary King -- Project Lead: James Honaker -- Lead author: Christine Choirat

Zelig: Everyone's Statistical Software is a single, easy-to-use program that can estimate, help interpret, and present the results of a large range of statistical methods. It literally is "everyone's statistical software" because Zelig uses R code from many researchers. We also hope it will become "everyone's statistical software" for applications, and we have designed it so that anyone can use it or add their methods to it. Zelig comes with detailed, self-contained documentation that minimizes startup costs for Zelig and R (with all methods described in exactly the same notation, syntax, and style), automates graphics and summaries for all models, and, with only three simple required commands, makes the power of R accessible for all users. Zelig also works well for teaching, and is designed so that scholars can use the same program with students that they use for their research.

Zelig adds considerable infrastructure to improve the use of existing methods. It generalizes the program Clarify (for Stata), which translates hard-to-interpret coefficients into quantities of interest; combines multiply imputed data sets (such as output from Amelia) to deal with missing data; automates bootstrapping for all models; uses sophisticated nonparametric matching commands which improve parametric procedures (via MatchIt); allows one-line commands to
Appendix G3. Search Results Page

Search

Enter terms data

Search results

10 Simple Rules for the Care and Feeding of Scientific Data, at SEAS, Harvard University.
Friday, October 25, 2013.
iacstark-lgsimplerules-merce.crosas.pdf

A Bridge from Publishing Words to Publishing Data
December 4, 2014
Read more

Crosas M. A Data Sharing Story. Journal of eScience Librarianship [Internet]. 2012;1:173-179. Publisher's Version @Abstract

Altman M, Andreev L, Diggory M, King G, Kiskis D, Kolster E, Verba S. A Digital Library for the Dissemination and Replication of Quantitative Social Science Research. [Internet]. 2001;Social Science Computer Review, 19:458-470. Publisher's Version @Abstract

Current Search

Search found 94 items
data

Sort By

Relevancy
Title
Type
Author
Date

Filter By Post Date

2014 (94)

Filter By Post Type

Presentation (51)
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