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Topic (i) Communicating effectively on the Web

USING PAPER PROTOTYPES TO TEST WEBSITE NAVIGATION

Supporting Paper

Submitted by The Economic Research Service, U.S. Department of Agriculture, United States of America[1]

I. INTRODUCTION

1. How do we help website visitors find what they are looking for? This is one of the most common and important questions for web managers and designers today. It is a persistent challenge to lead users to the content they need on the Economic Research Service (ERS) agency website. ERS has worked for years to improve the ability of visitors to find what they seek in the vast collection of agricultural economics information. These efforts have resulted in measurable success. This paper describes the process ERS used to test whether a new navigation scheme would help visitors find content on the website.

A. The ERS website redesign

2. ERS has known since 2002 that users of the website experience difficulty finding information. This is indicated clearly by user surveys, interviews, and testing. In 2003, when the United States Department of Agriculture (USDA) mandated that all of the Department's websites conform to a common look and feel, ERS decided to combine the redesign with improvement of its website's organization. ERS took a new, faceted approach to organizing content, using a hierarchical taxonomy of subjects, and two other facets—commodity and geography—which would all be available from a navigation menu. Defining this organization and structure of content took two years of content analysis and stakeholder consultations. Along the way, we tested the new organization independent of the website design. This test revealed that the organization of content itself was understandable, but it could not confirm that website visitors also would be able to navigate to what they seek. Any link on a page may be selected as the next target; thus testing the navigation menu alone does not necessarily reflect how users will really seek content on the website.

3. To test how users would actually seek content, the navigation menu would need to be tested in the context of the new website design. Unfortunately, because a website's organizational structure is tightly integrated into the entire website, there are more trade-offs than usual involved in the decision of when to test a new navigation scheme. The sooner a design is tested for usability, the less expensive it is to make changes. However, to thoroughly test the ease of navigating a website, the website must have a substantial portion of the pages built so it provides a realistic navigation scenario. This is the challenge we faced: How do we quickly build a realistic prototype to test website navigation effectively?

[1] Prepared by Nicholas Johnson (njohnson@ers.usda.gov) and Adrie Custer (acuster@ers.usda.gov).

II. BACKGROUND

B. Formative usability analysis methods

4. *Formative analysis* is usability analysis of a system conducted before the system is complete. It informs the design process, as opposed to *summative analysis*, which evaluates the outcomes of a system once complete. Making design changes based on usability findings from formative analysis is much less expensive than from summative analysis, because it is easier to change a website before than after it is built. Therefore, formative usability analysis is considered the most cost-effective way to improve the usability of a website.

5. There are several popular methods of formative usability analysis, which all use some kind of website prototype. A complete discussion of these methods is beyond the scope of this paper, but Usability Net has a good listing of methods at: http://www.usabilitynet.org/tools/methods.htm. *Usability testing* (sometimes called *performance testing* or *user testing*) is generally considered to be the most valid way of testing a website, because participants attempt to perform real tasks using the actual website or a working prototype. As with usability testing, the objective of our analysis was to dissect a scenario of navigating the website that is representative of real usage. However, because a working prototype could not be produced, performance testing was not possible. The solution we adopted was the formative analysis method of *evaluate prototyping*,[2] which we used to probe the most important cognitive processes of navigating through a website.

C. Evaluate prototyping

6. The evaluate prototyping method is an infrequently utilized formative usability analysis method that involves users in the early stages of development. A paper or machine prototype is used, and the emphasis is on probing the participants to explain their expectations and indicate any confusion. In our case, we tailored the method to reveal information about whether, during actual usage, the participants would be able to navigate the website in order to complete tasks. The study administrator asked specific questions targeted for this purpose.

III. METHODS

D. Prototypes

7. Prototypes include some details while omitting others. Since we were interested in testing the navigability of the website, our choice of details to include in the prototype was informed by our educated assumptions about navigational behavior. We chose to use a design prototype that included only a few fully designed pages. We believe the omission of the breadth of pages was worth the inclusion of the complete design details of a few pages, because any design element may affect how users navigate from a given page.

8. The pages we included in the test were the homepage and four "*navigational landing*" pages. These pages were included in the test, because we expect them to be the most common places where users will start navigating the new ERS website. Each navigational landing page is a summary listing of content on the ERS website related to a given category (see Figure 1). These included the Agricultural Economy and Commodity Outlook subject landing pages plus the Wheat and Alabama pages.

9. For each page we intended to test, we made two copies of its prototype, which we printed on paper: a "clean" copy and a "marked" copy (see Figures 2 and 3). The clean copy appeared as the page would on a web browser. The marked copy was identical to the clean copy, except for red circles at several locations where we would ask participants: "What will happen when you click here?"

[2] Usability Net. *Evaluate Prototype*. http://www.usabilitynet.org/tools/evaluate.htm

Figure 1: Navigational landing page.

Figure 2: Clean copy of the homepage prototype

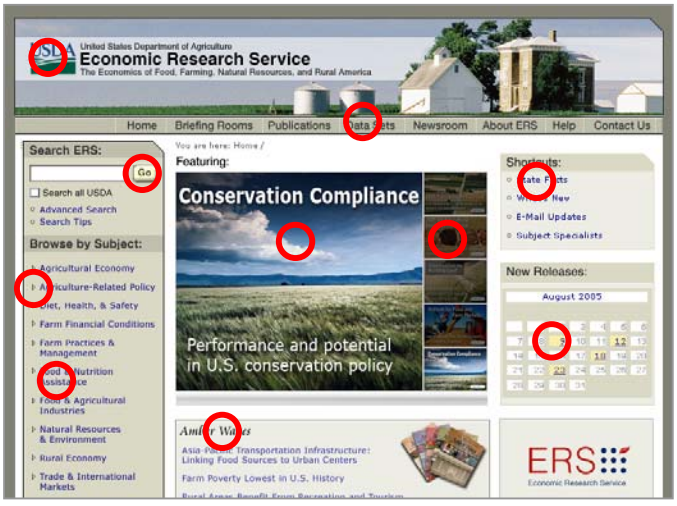

Figure 3: Marked copy of the homepage prototype.

E. Test protocol

10. After informing participants of their rights in the usability study (e.g., that they may quit and leave at any time), we asked them six questions for each page tested. The questions took about 20 minutes per page. Following are the questions and the order in which they were asked.

a. What is your first reaction to this page?

b. Where would you click to find…

i. an expert on wheat?
ii. data on how much rice Alabama produces?
iii. the commodity outlook reports?
iv. information on market structure and market concentration?

c. What do you think is the objective of this page?

d. Where are all the places on the page that you can click?

e. What will happen when you click here…? (pointing to each red dot marked on the marked copy of the paper prototype).

f. What on this page is confusing?

Question b was asked only on the homepage, because that is generally where users start their search for information. Question e was asked several times per page, once for each red circle on the marked copy of the prototype. Although only question b simulates the act of finding content, the other questions are also relevant to navigation, because when navigating a website, people must evaluate each page and make predictions about the next page[3]. At the end of the test, participants were also asked for their recommendations and for any general points of confusion across all the pages that were tested.

F. Participants

11. In December 2005, five participants were recruited from among permanent staff at ERS who represent potential users of the ERS website. Four participants were agricultural economists and one was a research editor. Although the test used a relatively small sample, it revealed several insightful findings about the website, its navigation system, and the test protocol.

IV. RESULTS

12. We obtained five useful results from our evaluation. The first finding was simply that all participants liked the design and structure of the website and its navigation. When we asked for participants' initial reactions to each page, they generally indicated that the site appeared more organized and professional than the previous ERS website. Additional findings related to navigation, interpretations of the homepage, usage of introduction paragraphs, and expectations of how an interactive menu would function.

13. Whether participants would be able to use the new organization to find content was analyzed with the question "Where would you click to find…" During this part of the study, we observed participant behavior and measured the success rates of participants. If the participant selected a link that would lead to the right content, it was considered a success. If he chose a link that did not bring him any closer to the content, it was considered a failure. The participants' navigation success rates were generally very high, except for the question about finding information on market structure and market concentration (see Table 1). These findings suggest that participants generally understood the website's navigation structure and how to move from the homepage toward completion of the four tasks tested. However, the labels used in the "Browse by Subject" list needed further improvement. Due to imprecise labelling, only one participant knew that market structure and concentration information was available by

[3] Furnas, G.W. *Effective View Navigation*. In Proceedings of CHI'97, pp. 367-374, ACM Press, 1997.

clicking the "Food & Ag Industries" link. This task also revealed that the majority of participants were confused by the "Agricultural Economy" subject. They reported that it was too broad and imprecise, because in fact the entire ERS website relates to agricultural economy.

Table 1: Navigation Success Rates

Where would you click to find…	Number of successful participants
1. An expert on wheat	5
2. Data on how much rice Alabama produces	5
3. The commodity outlook reports	4
4. Information on market structure and market concentration	1

14. It is well known that website visitors tend to avoid reading blocks of text, so we expected the introduction paragraphs on the navigational landing pages largely to be ignored or overlooked. However, all participants read the paragraphs to help them understand the meaning of the subjects. Unfortunately, these paragraphs were not finalized at the time of the study and did not accurately explain the Agricultural Economy and Commodity Outlook subjects. All participants raised this as a point of confusion, which highlighted the importance of these introduction paragraphs to navigating the ERS website.

15. Among the initial reactions was that almost all participants viewed the one large feature graphic in the center of the page as encompassing ERS's available content. The feature graphic incorrectly communicated the idea that ERS has a very narrow scope of content. One participant summarized this well: he thought the objective of the homepage was "to deliver information on conservation and compliance." This clearly indicated a failure to communicate to visitors the broad scope of content they can access from the ERS homepage.

16. Participants' expectations of website functionality were generally correct, except in the case of the commodity and geography dropdown menus. Below the "Browse by Subject" section of the navigation menu are two dropdown menus that allow users to get information related either to a commodity or a geographic location of interest (see Figure 4). When asked "What do you think will happen when you click on this dropdown menu?" several participants responded that they thought it would allow them to find information related to a specific commodity *and* geographical region. For example, they thought they could get information on wheat in Russia if they selected both. In reality, the dropdowns function independently, not in concert. This indicated a failure to communicate how the dropdown menus actually functioned.

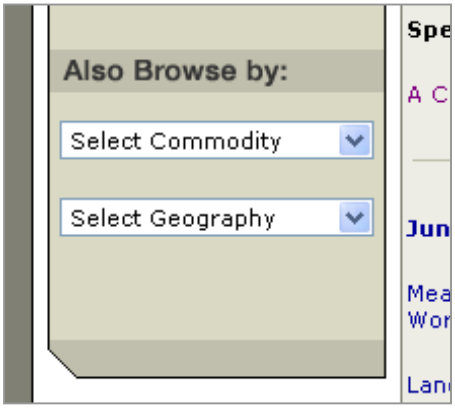

Figure 4: Browse by commodity and geography dropdowns.

V. DISCUSSION

17. Although the sample of participants and the number of prototype web pages were small, we were able to elicit some valuable findings about the navigability of our new website using the method of evaluate prototyping. We learned that overall, the navigation design and interaction were easy for participants to use, but that some elements needed improvement before users could navigate the website successfully. Areas for improvement included: ensuring the subject introduction paragraphs were accurate and concise, revising the homepage so it does not convey a restrictive scope of ERS content, and editing some subject labels in the navigation menu.

18. The evaluate prototyping method provided useful results about website navigability and involved real users sooner in the development lifecycle than other more popular methods. However, there are some disadvantages to the approach. Some pros and cons are:

- Pro: Because a prototype is used, it can be performed early in the development lifecycle.
- Pro: Analysis can be done at the page level, so it does not require the entire website to be developed or designed.
- Pro: Involving users yields more valid, real-world results than methods that do not, such as heuristic reviews and cognitive walkthroughs.
- Pro: It is easy to collect rich qualitative information including opinions, perceptions, and expectations.
- Con: The results are not as realistic as if a user test were performed with a working prototype of the entire website.
- Con: Few quantitative performance measures can be collected. For example, measuring the time spent on each task is better measured with a working prototype and a performance-based usability test.
- Con: Because there is significant prompting on the part of the study administrator, the risk of giving unintentional clues about the website is higher than with other methods.

19. Evaluate prototyping is a useful tool for designers to perform formative usability evaluation on navigational structures for websites. It is a method that is best used as a substitute for performance testing when performance testing is impractical due to the development timeline. We anticipate using evaluate prototyping on other website projects to get early results on the usability of website organization and structure.