The Effect of Structural Cues on User Comprehension, Navigational Behavior, and Perceptions

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Do people read on the Web?
Yes.....but

- “People don’t come to the web to linger over the words. Most uses of the web are for gathering information or doing tasks, not for the pleasure of reading.”
  - Redish (2007) *Letting Go of the Words: Writing Web Content that Works*

- “Whether an instructor is providing course enhancement through the Web or a complete online course, text will be an integral part of the instruction”
  - Davis (2003) Moore & Anderson *Handbook of Distance Education*
“U.S. consumers this year will spend more of their day surfing the Internet than reading newspapers or going to the movies or listening to recorded music”

SOURCE: Reuters, AUTHOR: Paul Thomasch August 8, 2007 (report from private equity firm Veronis Suhler Stevenson)
Introduction

- Web delivers large quantities of information needed for daily life—often replacing other avenues of access
- Readers must comprehend online text—they are reading to learn
- They must construct mental representations of the online text space
- Structural cues can help!
Overview

- Literature review
- Study goals & research question
- Study design & hypotheses
- Methods
- Results & discussion
- Conclusions & future research
Literature Review: Structural Cues

- Reveal the structure of an information space

- Print--words, phrases, or clauses that announce or emphasize content and/or reveal content relationships
  - E.g., headings, logical connectives, overviews/previews

- Online--design features that reveal the structure of a Web site or information space
  - E.g., navigational menus, graphical overviews, site maps
Literature Review: Structural Cues (cont.)

- Help readers develop mental representations of text spaces
- Reveal the relative importance of information
- Facilitate comprehension and search
- Enhance perceptions
- Decrease disorientation
- Focus browsing
Literature Review: Context & Task

- **Context**
  - Content domain—site purpose

- **Tasks**
  - Searching vs. browsing
  - Reading to do vs. reading to learn
  - Specific vs. non-specific
    - Benefit more from cues
    - Are more constrained in their navigation
Prior knowledge influences the benefit of structural cues
- Domain or content knowledge
- Web/computer experience

Text perceptions influence the benefit from structural cues
- Familiar
- Easy
- Enjoyable
- Interesting
Study Goals and Research Question

- **Broad study goals**
  - Provide empirical support for effective design of Web-based structural cues
  - Assess readers remotely through the Web

- **Research question**
  - What is the effect of text previews and navigational tab menus on users’ comprehension, navigational behavior, and perceptions?
Study Design

- Text previews
  - Preview w/ embedded links
  - Preview w/ link list
  - Link list only

- Navigation tab menus
  - Present
  - Absent

- Between subjects design
Hypotheses

- **Previews will:**
  - Facilitate comp. (esp. inferential)
  - Increase engagement with the site
  - Enhance perceptual ratings

- **Navigational menus will:**
  - Facilitate comp. (esp. factual)
  - Increase site exploration
  - Enhance perceptual ratings
Methods: Subjects

- Recruitment
  - Flyers in engineering courses
  - Incentives: course points and chance to enter drawing

- Demographics
  - 282 undergraduates
  - 76% male
  - 90% between 18 and 25 years of age
Methods: Materials

- Experimental Web pages
  - Big Bend National Park Web site
  - Hierarchical site (21 pages, 3 levels)
- Introduction & instructional pages
- Browsing scenario
- Survey instruments
  - Computer experience & demographics
  - Perceptions
  - Comprehension (16 inferential; 16 factual)
  - Text judgments & open-ended questions
Big Bend is famous for its natural resources. The park, with its spectacular geology, is home to more than 1,200 species of plants (including approximately 60 cacti species), 11 species of amphibians, 56 species of reptiles, 40 species of fish, 75 species of mammals, 450 species of birds, and about 3,600 species of insects. The park boasts more types of birds, bats, and cacti than any other national park in the United States. Learn about the challenges to preserving the Air Quality in Big Bend, the Geological Formations that have shaped the land, the diverse Plant Life found within the park, and the unique contributions of the Rio Grande River to life in the region.
Big Bend

U.S. National Park Service

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This page adapted from the U.S. National Park Service for purposes of educational research.
Methods: Procedure

- **Subjects**
  - Logged in remotely
  - Read instructions, took pre-survey, & read the browsing scenario
  - Browsed the test Web pages in one of six preview/menu conditions
  - Took post surveys

- **WebLab UX delivered all experimental materials and collected all data**

- **Data were analyzed in SPSS 14.0 Win**
Results/Discussion: Overview

- Results/discussion presented for:
  - Computer experience & text judgments
  - Inferential & factual comprehension
  - Navigational behavior
  - Perceptions

- Significance level is $p \leq .05$

- Nonnative English speakers were removed—they differed significantly

- Time in study site ($M = 13.4 \text{ min}$)
Results/Disc.: Computer Experience

- **Web-savvy subjects**
  - High levels of comfort with computers and the Web (67% = somewhat/very comfortable)
  - Many years of Web experience (92% > 6 yrs.)

- **Moderate levels of ongoing use**
  - Majority (72%) spend < 2 hrs/day on Web
  - Searching much more common than browsing
Results/Discussion: Text Judgments

- Subjects found the content of the Web pages:
  - Quite unfamiliar (only 8% familiar or very familiar)
  - Slightly easy (44% easy or very easy)
  - Not very interesting (25% interesting or very interesting)
  - Even less enjoyable (17% enjoyable or very enjoyable)

- Subjects bring little prior domain knowledge and motivation to the task.
Results/Discussion: Comprehension

- Previews affected comprehension
  - Previews w/ embedded links led to the sig. higher **inferential** comp. than previews w/ link list
  - Previews did not affect factual comp.

- Nav. Menus did not affect comp. (inferential or factual)
Results/Discussion: Navigation

- Previews affected exploration
  - Link list only led to sig. greater % of pages seen than previews w/ link list
  - Link list only led to sig. greater # of 3rd level content pages seen than previews w/ link list

- Nav menus also encouraged exploration (trend, $p = .066$)
  - Nav. menus led to greater % of total pages seen
Results/Discussion: Navigation (cont.)

- Previews affected engagement
  - Previews in general (w embedded or w/ link list) versus link list only led to sig. more time spent on:
    - 1st and 2nd level overview pages
    - Total 3rd level content pages

- Nav menus did not affect engagement with overview or total 3rd level pages
Results/Discussion: Perceptions

- Previews affected perceptual ratings (SUS and Use)
  - Previews with link list and link list only led to significantly higher ratings than previews with embedded links
- Nav. menus led to sig. higher ratings than no nav. Menus
Subjects disliked previews w/ emb. links when there were no nav. menus
Conclusions

- Previews w/emb. links improve inferential comp.
  - They help readers build mental representations of the content space
- Previews w/emb. links are unexpected and disliked
- Previews increase time spent in pages
- Nav. menus increase site exploration and user ratings
  - People are used to nav. menus
- Nav. menus do not affect comprehension
  - Given that, on average, people spent 13 min. in the site—we question this result
Conclusions \textit{(cont.)}

- Web designers must weigh tradeoffs between designing for comprehension, exploration, and perceptions.
- Design decisions must be context specific.
Future Research

- Finish analyzing data, open-ended responses, and navigational paths
- Strive to examine actual users of natural Web sites
- Continue development of WebLab UX—the toolkit
- Continue investigating the effect of design variables on users who are reading the Web in order to learn information
- Develop empirically based guidelines for Web design
For More Information

http://depts.washington.edu/intres

INTERNET-BASED RESEARCH
@ The University of Washington

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Using the Internet to Study Users Interacting with Web Sites in Natural Settings

Welcome to the home page of the Internet-Based Research group, a Directed Research Group in the Department of Technical Communication. The group, directed by Professor Jan Spyridakis, has been studying how various features of the design of online information affect user behavior, comprehension, and perceptions. The research has focused on using online, remote methods to identify how people are using Web sites in order to optimize the user experience and on writing software to stitch (WebLab-UX) that will dynamically generate alternative Web sites, deliver them randomly to participants through the Internet, generate surveys, and collect survey results as well as server log files and structured log data. Our goal has been to study users interacting with Web sites using their own computing environments at a time of their own choosing.

We welcome your interest in our work whether that is in taking a look at our past and current studies, looking at the results of some of our published studies, or seeking our support in helping you access online information and its design. We are seeking hands and cooperative projects. We hope to be able to spend more time developing tools to integrate with host Web sites or that stakeholders want answers about their site designs. Our goal is to refine our WebLab-UX so that researchers, usability specialists, and other stakeholders can use it to assess samples of subjects remotely through the Internet. If you are interested in talking to us about such use of our WebLab-UX or funding opportunities, or about using a specific Web site as a testbed, please email Dr. Spyridakis at jan@depts.washington.edu.