Does Underlining Links Help or Hurt?

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Abstract

Two types of link treatments, underlined or non-underlined, were investigated in the context of three web pages. Over 1,000 participants completed tasks for which the answers were found either on the pages or by clicking a link. Task accuracy, speed, and ratings were collected in an online study. Conflicting findings suggest that primarily navigational pages should use underlined links, while informational pages should not.

Keywords

Link, link treatment, underlining, web design

ACM Classification Keywords

H.5.4. Hypertext/Hypermedia.

General Terms

Design, Experimentation, Human Factors

Introduction

A number of decisions need to be made in the design of web pages, from major content to minute details. One decision that may have a significant effect on the user experience is the link treatment for a page. Usability guidelines currently state that affordance should be maximized by visually distinguishing links through underline and color [4]. Other research suggests that it may not matter, as long as there is consistency across a page [5]. General guidelines from both usability and

design websites agree with this research; if the method is consistent, links don't have to be underlined [2,3]. Of the Top 40 e-retail web sites recently ranked by ForeSeeResults [1], 32% primarily use underlined links while 68% do not.

In this paper, we take a step towards understanding if link treatment has an effect on user performance and perceived ease of tasks, as well as whether task type – answer found directly on a page or by clicking a link – influences this.

Method

This study was conducted online on the Intranet at Fidelity Investments. Two link treatment styles (underlined or not) were studied in the context of three web pages. Link treatment was a between-subjects variable; each participant saw and used only one of the two link treatments, which was consistently displayed across all three pages.

Link Treatments

For both two link treatments studied (Figures 1 & 2), the link text was blue (RGB value of 0, 85, 140). In the underlined condition, the link text was also underlined. On hover, underlined links became red (RGB: 204, 51, 0) and kept their underlining, while non-underlined links became underlined and stayed blue.

Web Pages

All three of the pages presented financial news and information of some type. None were real pages, although they were patterned after real pages. At the start of the online study, participants were shown a landing page containing links to each of the three pages. As directed by their tasks, participants chose
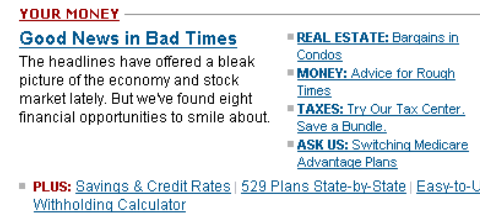

Figure 1. Example of the underlined link treatment.

Figure 2. Example of the non-underlined link treatment.

the appropriate page to perform the task. The three pages are illustrated in Figures 3, 4, and 5. All three pages scrolled, containing about three screenful each.
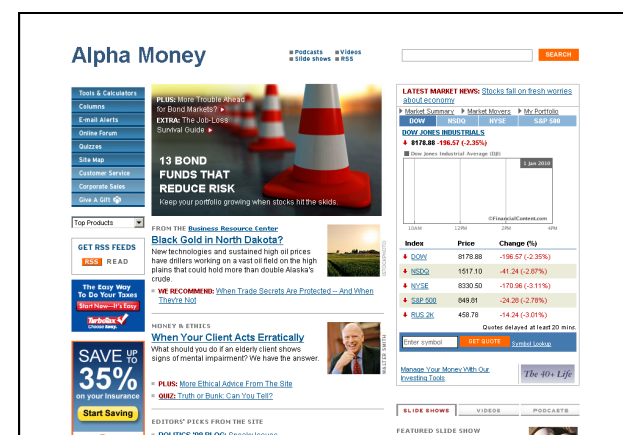

Figure 3. Example of the Alpha Money page.

Figure 4. Example of the Beta Portfolio page.

Figure 5. Example of the Theta Financial News page.

Figure 6. Example of the online study configuration.

Once the answer to the task displayed in the top window was found in the lower window, the answer was selected from the drop-down list in the top window.

Tasks

Each participant was given the same twelve tasks to perform using the pages, although in a random order. Participants viewed the task in a window at the top of the screen and the page in which the task was to be completed at the bottom of the screen, as illustrated in Figure 6. The participant then rated the task difficulty and clicked the "Next" button to proceed to the next task. Time for each task is measured from the moment the task is displayed until the "Next" button is clicked.

The twelve tasks were as follows:

1. What article is most recommended on Theta Financial News within the last 7 days?

2. According to Theta Financial News, how is the S&P 500 performing today?
3. Using Theta Financial News, find an article on starting to invest. Click the link for the answer.
4. On Theta Financial News, where would you post a question for other users to respond to? Click the link for the answer.
5. According to Alpha Money, what is today's change in the S&P 500?
6. On Alpha Money, what is the story that has been e-mailed most today?
7. On Alpha Money, find an article that will help reduce the chance of personal information, like your social security number, being stolen. Click the link for the answer.
8. On Alpha Money, find out how much money you should have deducted from your paycheck every month so that you won't owe too much in taxes at the end of the year. Click the link for the answer.
9. On Beta Portfolio, find the last price of Zoran Corporation.
10. According to Beta Portfolio, when is CSCO's third quarter 2009 Earnings Release taking place?
11. On Beta Portfolio, find the symbol for inVentive Health Inc and click the link for the answer.
12. On Beta Portfolio, find an article about a decision that Boeing and Northrop are arguing over. Click the link for the answer.

Those tasks were of two basic types:
- Tasks for which the answer was on the page itself (Tasks 1, 2, 5, 6, 9, 10).
- Tasks for which the answer was found by clicking on a link (Tasks 3, 4, 7, 8, 11, 12).

For the tasks that required the user to click on a link, that link brought up a new page containing only a page number to identify it. The participant then chose that page number from the drop-down list as their answer. The drop-down list of answers for each task always included an "I Give Up" option.

Post-Study Rating Scales
After performing all twelve tasks, the participants were asked to rate the pages they had used on the following two scales:

- How visually appealing did you find the link treatment on these sites? (7 points: Not at all appealing to Very appealing)
- Overall, how easy or difficult was it to find the links you were looking for? (7 points: Very Difficult to Very Easy)

Participants
Participants were employees of Fidelity Investments worldwide. They were recruited through an email message of announcements sent every morning by the Employee Communications department to all employees. All participants were entered into a random drawing for a $100 gift certificate.

Results
A total of 1,026 people completed the study. They ranged in age from their 20's to 60's, with 48% female and 52% male. Participants were randomly assigned to one of the two link treatment conditions, although for reasons unrelated to this paper, the probability of assignment to the non-underlined condition was twice that of the underlined. A total of 347 people completed the underlined condition and 679 completed the non-underlined.

The primary data collected were task completion accuracy, task time, task ease rating, and the two post-study ratings. An additional metric reflecting task efficiency was derived from the number of tasks each participant completed correctly per minute.

There were no significant differences between the two link treatments for any individual tasks in mean task times or task ease ratings. However, one task yielded a significant difference in task completion accuracy, as shown in Figure 7. All error bars in this paper represent the 90% confidence interval.
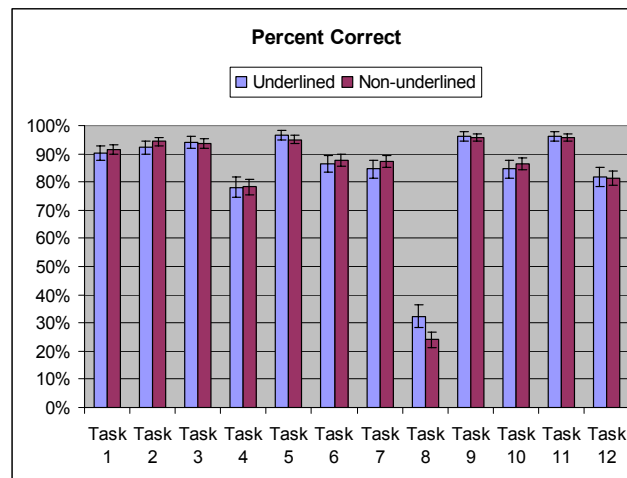

Figure 7. Task completion accuracy for all tasks.

Figure 7 shows that the task success rates were very similar for the two link treatment conditions. Only one task, Task 8, showed a significant difference between the two link treatments (p=.02 by t-test), with the underlined links yielding significantly better results. Note that this was also the most difficult task overall.

The two post-study rating scales (visual appeal and ease of finding links) yielded no significant differences.

It is also possible to compare the two types of tasks: those for which the answer was on the page and those for which a link had to be clicked to get the answer. Overall, there were no significant differences for the tasks where the user had to click on a link. For the tasks for which the answer was on the page, however, there was a small but statistically significant difference in efficiency between the two link treatments, as illustrated in Figure 8.
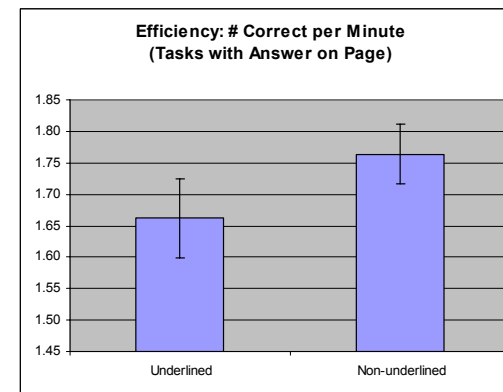

Figure 8. Efficiency (number of correct tasks per minute) for the tasks where the answer was on the page itself.

For the tasks where the answer was on the page itself, the participants tended to be more efficient with the non-underlined links. In addition, they rated the tasks as significantly easier with the non-underlined links, as shown in Figure 9.

Discussion and Conclusions

This study yielded two conflicting but interesting results. For one rather difficult task in which the user had to find a link (Task #8), participants were more successful when the links *were* underlined. (Note that
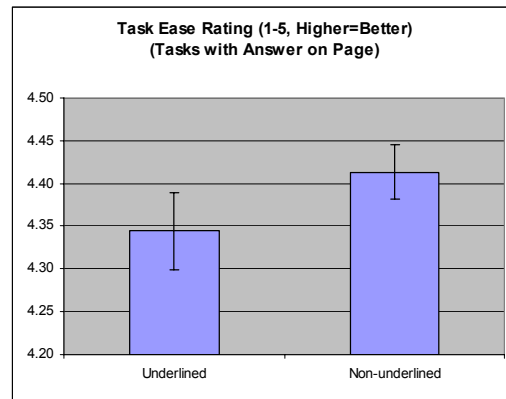

Figure 9. Mean task ease ratings (1-5 scale) for the tasks where the answer was on the page itself.

the answer for this task was found by clicking on the "Easy to Use Withholding Calculator" link shown in Figures 1 and 2.) Overall, however, for the tasks in which the answer was on the page itself, participants tended to be more efficient in finding the answers when the links were *not* underlined. This perhaps implies that rather "challenging" links are found better when underlined, but that underlining links tends to obscure information slightly when the page itself contains the information being sought. A preliminary implication of this could be that pages primarily for navigation should use underlined links, while pages primarily of data should not. Clearly, this kind of mixed approach would need to be tested in a follow-up study.

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