# An Evaluation of Landmarks for Re-finding Information on the Web

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## ABSTRACT

Re-finding information on the Web is a common yet often time consuming and challenging task. Even with the use of traditional bookmarks, which allow users to return to a previously visited page, it can be hard to re-find facts within that page. Furthermore, it is not uncommon for users to have long and unmanageable lists of bookmarks, making it difficult to identify the purpose of individual bookmarks. In this paper, we present an extension to traditional bookmarks called landmarks, a user-directed technique that aids users in returning to specific content within a previously visited web page. We investigate the efficiency of landmarks for re-finding of information on web pages and present the findings of a study in which participants were first primed on two web pages and returned at a later date to re-find the information using both traditional bookmarks and landmarks.



### Author Keywords

Re-visitation, re-finding, landmarks, bookmarks, web, tasks

### ACM Classification Keywords

H.5.4 [Information Interfaces and Presentation (e.g., HCI)]: Hypertext/Hypermedia . Navigation


## INTRODUCTION

Understanding how people use information on the web and the type of web tasks that people undertake is important. Re-visiting previously seen information on the web is a significant task that users often perform and one that researchers continue to seek to improve. A 1995 study [10] found that 58% of visited web pages were previously viewed and in 2001 [4] this number of re-visitations had increased to 81%. Cockburn et al. [3] found that re-visiting previously viewed web pages was a dominant task undertaken by users and that four out of five web pages visited had been previously seen. Re-finding specific information on the web requires both the relocation of the page and then the re-finding of specific information within the page. In this paper, we investigate the use of landmarks to improve the efficiency of re-finding on web pages.

## BACKGROUND

Abrams et al [1] found that despite the obvious benefits of bookmarks, major problems exist with them. Users identified organization and management of bookmark lists, re-finding bookmarks within the structure of user's bookmarks, and the lack of naming descriptions of bookmarks as being common problems. Jones et al. [6] also reported that users found that despite the re-visitation purpose of bookmarks that their names tended to lack meaning and did not provide a descriptive reminder function. While users can change the default name (usually the web page title) for a bookmark, they often choose to use the default [1]. After time, users can find it difficult to make sense of why a page was originally bookmarked in terms of context and relevance.

Earlier research has examined improvements and additional tools for re-visiting a previously seen web page. For example, Kaasten and Greenberg [7] integrated the back key, history list and bookmarks into a single tool and provided a visual representation of often visited pages, while WebView [3] has browser enhancements such as zoomable thumbnail pages integrated with back/forward menus. These approaches are designed to re-visit a particular web page but not for re-finding specific information previously accessed within the web page itself. Users re-visit web pages for a variety of reasons. We are interested in users returning to a page in order to re-find previously seen information.

There are two basic problems with re-finding web information using traditional bookmarks: one is to find the correct bookmark within a sometimes unwieldy list and the second is to re-find information on the actual web page. We are focusing on the latter. Users create bookmarks for pages that frequently update web content, such as a news site [1] and for pages that contain specific information that they may need again, such as a contact or directions.

While bookmarks return a user back to their desired web page they do not assist the user in re-finding information on the page. Instead, users must scroll or use the find function to re-locate specific information. Annotations applications enable users to create and view notes made on the page or about a specific page, such as HATS [8]. Annotations made

within the web page may help with page re-finding, although this is not their primary focus and require user effort to create, maintain, open and read. Still, they can provide a reminder function often lacking with bookmarks and can be used to provide the context to a bookmarked page although the user may have to expand and/or read the note(s) placed within the document to determine this.

Users have been found to create separate documents containing URLs of visited pages and information found within web pages [1, 6, 9] to help with the problem of revisiting and re-finding information on the page. This approach does enable users to access specific information, but it requires that users take individual pieces of information from the context of the original source and exert effort to create and manage a new collection of information. Our goal is to help users easily re-find specific information by providing additional functionality to bookmarks rather than creating additional sources of data.

## LANDMARKS

In every day life, people use landmarks such as a building on a city street, to help orient themselves and provide direction. These stationary landmarks provide a visual association that can reaffirm location to users and are useful when first finding a destination and later returning. In this study, we have used a visual landmark metaphor and have incorporated landmarks into a customized version of Internet Explorer (IE).

Landmarks allow users to mark information on a web page that they may want to return to at a later date by highlighting the text and adding a landmark in the same fashion as they would a Favorite in IE. One or several landmarks can be added to a page and they can be renamed and organized into folders or a list. When the user selects a landmark from their Favorites list (symbolized by a flag beside the landmark) it will return them to the page and to the exact location of text, which is highlighted, for easy recognition (Figure 1).

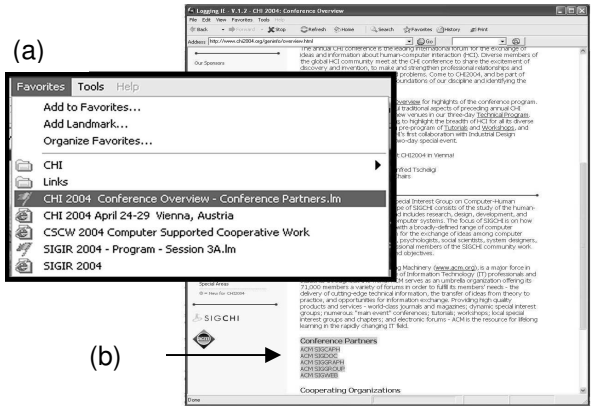


**Figure 1. The user selects a landmark from the Favorites folder (a). The page automatically goes to the highlighted landmarked information for easy identification (b).**

Landmarks are not meant as a replacement for the bookmarking facility but as an enhancement that help users return directly to previously visited information, giving context to marked pages. They are different from annotations in that they do not embed user comments or notes into a document, rather they simply mark a particular point of interest within a page that users can later return to in one action (i.e. selecting from Favorites menu). The main advantage of landmarks is that they allow users to return quickly and easily to a specified piece of information without subsequent re-finding effort within the page.

## METHODOLOGY

The effectiveness of landmarks for re-finding information on websites was evaluated by comparing times to re-find information using landmarks with times using bookmarks.

We recruited 20 (15 male and 5 female) Computer Science students to participate in this study. There were two half hour sessions, which took place 2-3 days apart. All participants had previous experience using both the web and bookmarks.

### Experimental Task

Two conference websites (www. chi2004.org, www.acm. org/cscw2004,) were used because they shared similar layouts and content. Only two users were *somewhat familiar* with the sites (one with the CSCW website and one with both sites). Users participated in two sessions. At each session, participants completed a block of seven comparable fact-finding tasks (one for training and six for testing) for each website. Examples of tasks included: *Under Staff of the Conference Committee, who is the Publicity Coordinator*? and *In Computing, it informs you of a web address in order to use your PDA. What is the PDA friendly web address?*.. The tasks included *hints* as to where information could be found simply because the goal of the first session was to prime the participants so they could return to the information in the second session.

### Procedure

During pilot testing, we observed that when participants used landmarks first to complete the block of tasks their normal bookmarking behavior changed. Therefore, in session one, participants completed the first block of tasks using bookmarks first to eliminate any learning effect. During the first session, the order of the websites visited by the participants was counterbalanced. Using the first website, participants completed the block of fact-finding tasks and bookmarked the pages containing the relevant information. Participants were told to imagine they had come across information they may want to return to in the future and to organize and name the bookmarks as they normally would. Upon completion of this first block of tasks, participants were introduced to landmarks and given a short training session on their use. They completed the second block of tasks on the alternate website and

landmarked the relevant information in order to return to it during their next session.

The second session was completed by all participants 2-3 days after the first session. The order of re-finding technique was counterbalanced. Once the information was re-found on a page, participants highlighted the information demonstrating that the information was found and clicked a button on the toolbar to signify the end of the fact-finding task in the logging software. Upon completion of the first block of tasks, participants completed the second block of tasks using the alternate re-finding technique and website.

### Data Collection

A background questionnaire was administered at the beginning of the first session to capture demographic information and previous experience using bookmarks. During the sessions, data was collected through video capture, researcher observations, and data logging. A detailed questionnaire was presented to users at the end of the second session to explore their thoughts on re-finding information using bookmarks and landmarks.

## RESULTS

Our results were based on the time to re-find previously seen information using both techniques. The time to re-find was calculated during session 2, from the time when the page of interest finished loading until participants clicked the button to indicate they had found the information. Overall, we encountered five instances for Website #1 and three instances for Website #2, in which a participant's re-finding time for a single task was omitted due to technology failures (i.e., logging tool failed to capture the time and network problems).

The complexity of the tasks and screen depth were similar for both websites. A correlation analysis of similar questions from each website found no similarity between the data, therefore separate analyses were conducted for each website.

### Website #1

The mean re-finding times (in seconds) for both landmarks and bookmarks on Website #1 are shown in Figure 2.

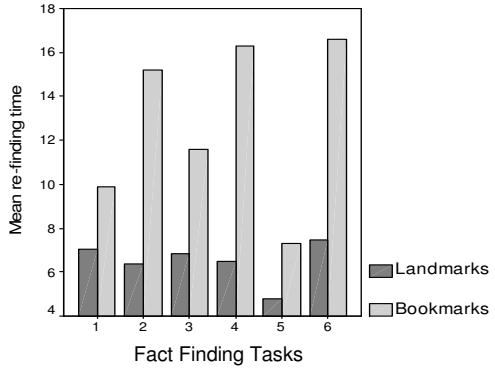


**Figure 2. Mean re-finding times for Website #1 (CHI)**

Participants accurately re-found all facts with bookmarks and landmarks.

A repeated measures ANOVA showed a significant interaction effect between the re-finding technique and the tasks ($F(5,65)=4.328$, $p=0.002$). To further explore this interaction effect, we ran six one-way ANOVAs to compare the two navigation techniques. A Bonferroni adjustment was used to correct for the increased chance of a Type I error. Therefore, statistical significance was taken at an alpha level of 0.008. The results are shown in Table 1.

| Fact-finding task | *df* | *F* | *P* |
|---|---|---|---|
| 1 | (1, 17) | 2.458 | .135 |
| 2 | (1, 16) | 18.195 | .001† |
| 3 | (1, 18) | 15.302 | .001† |
| 4 | (1, 18) | 26.391 | .000† |
| 5 | (1, 16) | 12.326 | .003† |
| 6 | (1, 18) | 10.692 | .004† |

†Significant at the p = 0.008 level

**Table 1. Re-finding times for Website #1 (CHI)**

We found a significant difference in the re-finding times for 5 of the 6 tasks. Further examination of the task for which there was no significant difference in time showed that the relevant information was located at the top of the page.

### Website #2

The mean re-finding times (in seconds) for landmarks and bookmarks on Website #2 are shown in Figure 3. Participants accurately re-found all facts with bookmarks and landmarks.

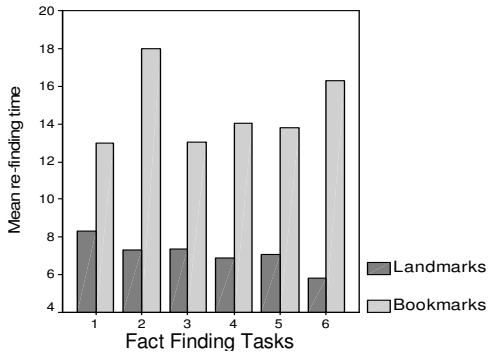


**Figure 3. Mean re-finding times for Website #2 (CSCW)**

A repeated measures ANOVA showed a significant between-subjects effect ($F(1,16)= 16.496$ $p=0.001$) for the time to re-find information. Because of the findings from Website #1, we were interested in exploring for which of the individual tasks there was a significant difference in re-finding time. Again, we conducted six one-way ANOVAs to compare the two navigation techniques. Statistical significance was taken at an alpha level of 0.008 using the Bonferroni adjustment. The results are shown in Table 2.

| Fact-finding task | *df* | *F* | *P* |
|---|---|---|---|
| 1 | (1,17) | 2.025 | .173 |
| 2 | (1,18) | 26.239 | .000† |
| 3 | (1,18) | 16.134 | .001† |
| 4 | (1,18) | 15.677 | .001† |
| 5 | (1,16) | 7.645 | .014 |
| 6 | (1,18) | 18.239 | .000† |

†Significant at the p = 0.008 level

**Table 2. Re-finding times for Website #2 (CSCW)**

A significant difference was found in the re-finding times for 4 of the 6 tasks. A closer examination of the two tasks with no significant difference in the re-finding times, revealed that the location of the requested information was in once case at the top of the page and in the other case located at the bottom of the page.

## DISCUSSION & FUTURE WORK

Our evaluation of the efficiency of landmarks for re-finding previously seen information on the Web revealed that participants were able to re-find the information significantly faster using landmarks. The only exception is in the case where the required information was located on either the first screen or the bottom of the page, in which case there was no difference in time between the two techniques. In these cases, we suspect that the location of the information provided a natural landmark in itself. Still, the results of this study suggest that landmarks are an efficient tool for re-finding information on a specific web page.

In the post-questionnaire, we asked participants to agree/disagree with a set of statements using a 5 point Likert scale. Overall, participants were enthusiastic about using landmarks. For the most part, participants understood without being explicitly told that the purpose of landmarks is to mark specific information on a web page that they may want to re-find in the future. Eighteen participants agreed (*13 strongly agree, 5 agree*) that creating a landmark on a page was easy and two participants were *neutral* on the ease of use. Sixteen participants reported (*10 strongly agree, 6 agree*) that it was easier to use landmarks compared to bookmarks to re-find information on the web, with four participants reporting a *neutral* response. Nineteen participants agreed *(13 strongly agree, 6 agree*) that landmarks were faster than bookmarks to re-find information on the page with one participant choosing *neutral*. All but one of the twenty participant responded that they would prefer using landmarks to re-find information on the page rather than other re-finding methods (i.e. scroll or find) needed with bookmarks.

One possible limitation of landmarks is a common issue with most hypertext systems. When a user selects a link in a hypertext document they jump to a new location within the document which may cause the user to become disoriented due to the loss in context [5]. This could occur over time with landmarks if users do not provide meaningful names specific to landmarked information. Similar to bookmarks, landmarks are not effective if the URL is broken and if marked information on a page changes, in its current implementation, a set landmark may be lost. However, studies on enabling persistent annotations after document changes [2] could be applicable to landmarks.

Currently, while users can only make landmarks for textual information, we would like to expand this functionality to include images and other media. Some users also indicated that they would like to use the right click menu to add landmarks; this is a natural extension of the traditional highlight and right click function common to many applications. Based on the results of this study, we believe that landmarks are an efficient tool for re-finding information on the Web and would like to further explore the use of landmarks outside of a laboratory setting through a longitudinal field study. This would provide a richer understanding of how users would incorporate landmarks in their everyday web activities in a natural environment.

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