

Studying Elapsed Time and Task Factors in Re-Finding Electronic Information

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ABSTRACT

In this paper, I report on a continuing line of research to investigate factors that affect refinding in personal information management. Two such factors are examined here: task type and the elapsed time between finding and refinding. A research study is described that examines the effects of task type and elapsed time in refinding information on the web. The first stage of this study has finished, and data collection for the second stage was recently completed at the time of this writing. At the workshop, preliminary results will be presented.

INTRODUCTION

Task type is known to be a large factor in many information retrieval and human-computer interactions. Prior work has shown that task type can affect aspects of refinding [4, 5]. However, little research has been done to characterize these effects in terms of specific types of tasks. Also needed is a better understanding of how elapsed time affects users' refinding tactics. In this paper, these two factors (task type and elapsed time) are discussed and a controlled, laboratory study their effects on refinding is described.

Controlled studies play an important role in the study of information use and retrieval, allowing some factors to be controlled in order to help isolate the effects of other factors. However, controlled studies often must be run in laboratory environments, leading to concerns about ecological validity. The study presented here uses an existing, realistic set of information seeking tasks that have been examined in a previous study by White and Iivonen [7]. In addition, the study is being conducted in a multi-purpose computer lab to help create a "real-life" information seeking setting.

This research focuses on a specific type of refinding – refinding information that has been seen before on the Web (i.e. web pages) – with an overall goal of gaining a better

understanding the effects of task type and elapsed time on refinding in order to help designers build better PIM tools. This in turn will help users manage and make better use of their personal information.

REFINDING TASK TYPES

There are many ways to characterize finding and refinding tasks [2, 6]. Often higher-level factors such as the task domain or overall goal of the activity dictate an appropriate set of task characterizations. For example, Morrison, Pirolli, and Card [6] outlined three task classifications based on purpose, method, and content.

Characterization of refinding tasks presents a unique aspect that is not present in traditional information retrieval tasks to find information – by definition, refinding requires the user to have completed a counterpart *finding* activity sometime prior to the refinding activity. Thus, a refinding task can be characterized in relation to a finding task by measures of *task similarity*. Two such measures are described here. First, the pair may be classified according to the similarity of the *information need* from the finding to the refinding task (see Table 1). This study focuses on tasks that are in either the "exact" or "subset" categories.

Table 1. Task Characterization based on Information Need

Exact	F: web site of Joe's pizza R: web site of Joe's pizza
Related	F: phone number of Joe's pizza R: address of Joe's pizza
Fungible	F: any web site with Joe's pizza phone # R: any web site with Joe's pizza phone #
Subset	F: sweaters for Mom's birthday R: the red sweater I saw that Mom would like
Superset	F: web site about global warming R: more info about global warming

F = finding task, R = refinding task

Second, refinding tasks may be characterized in relation to the finding task by a measure of the *information location* – i.e. where the information is located from the finding to the refinding task. The information may be located in: 1) exactly the same location, 2) somewhere along the path taken when finding, or 3) in a different location (e.g. web

pages that are moved, or web pages such as www.cnn.com in which the content changes on a daily or hourly basis).

Information science and retrieval research provides additional classification schemes for finding tasks that have relevance for both finding and refinding. A primary and well-established task distinction is whether the task is focused on finding a specific piece of information (a closed task) or is more exploratory in nature (an open task). A second dichotomous task distinction is whether the information source to be used is predictable or unpredictable. This can be considered a measure of the task complexity – are there common information sources for this task? For example, we might predict that to find the name of the editor of the New York Times, many people would go to the New York Times web site. However, for a task to find the causes of the rise in obesity in the United States, it is likely that people would use many diverse sources. White and Iivonen [7] developed a set of 16 web search tasks balanced across the four combinations of the two task types (open/closed, predictable/unpredictable). In the study described here, their 16 tasks are adapted for use to explore not only finding but also refinding across these dimensions.

ELAPSED TIME

In the context of refinding, *elapsed time* is the time between the finding activity and the refinding activity. Elapsed time is known to be an important factor in forgetting [1]. Furthermore, over time, additional similar stimuli can cause interference with existing memories [1]. Few studies have examined the effects of elapsed time on refinding and a better understanding of how elapsed time affects the strategies used for refinding will help designers build better refinding tools.

The study presented here examines how different periods of elapsed time affect refinding behaviors. Two different time periods are considered: a one-week delay and an eight-month delay. These time periods are considered likely to be at the extremes: the one-week period providing insights about a lower bound and the eight-month period helping to establish upper bound effects.

TIME AND TASK REFINING STUDY

The goals of this study are to examine how the factors of task type (open vs. closed, predictable vs. unpredictable) and elapsed time (one week, eight months) affect refinding behaviors. The study is divided into two phases: the one-week elapsed time and the eight-month elapsed time.

Phase One – Forty-eight participants completed the first phase, which consisted of two sessions, scheduled about one week apart. In the first session, participants were presented with a set of 24 tasks to find information on the Web. Of these tasks, 16 were the tasks adapted from those used by White and Iivonen [7], divided into four groups (open-predictable, open-unpredictable, closed-predictable, closed-unpredictable) of four tasks per group. For these 16 tasks participants were asked to find at least one answer,

but participants were allowed to submit additional answers if they desired. The eight additional tasks were open-unpredictable and asked participants to find at least three answers. A sampling of the tasks is presented in Table 2.

Table 2. Sample Task Descriptions

Closed Predictable	Who are the current members of NATO, the North Atlantic Treaty Organization?
Closed Unpredictable	What does the term “the China Syndrome” refer to?
Open Predictable	What is the World Health Organization doing to stop river blindness in Africa?
Open Unpredictable	What is the difference between the European approach and the American approach to protecting privacy on the Web?
Additional Open Unpredictable	Imagine that you need to buy a gift for a friend or relative and have decided to buy him/her a sweatshirt. Find three sweatshirts on three different web sites that would be good possible gifts.

Several approaches were used to help maximize the validity of this study. First, the 16 tasks adapted from White and Iivonen [7] had been studied and found useful by another group of researchers. Establishing and using well-understood task sets is an important step in comparing results of different studies. Second, all the tasks used represent realistic questions and information needs that people would be likely to investigate on the Web. Third, participants were recruited widely at the University of North Carolina and represent a broad sample from the community, including a diverse set of students and staff.

The study was run as a “batch mode” study in a computer lab on the UNC campus with up to eight people participating at the same time. The computer lab has approximately 30 personal computers with 17” LCD monitors and is a commonly used multi-purpose lab for computer use, located adjacent to one of the campus libraries. In most cases, participants were seated with at least one computer in between them and the next participant. Performing the tasks in this setting is similar to doing research for a course project in a computer lab and was part of the effort to create a realistic information seeking setting.

For each task, the following dependent measures were collected: the web pages visited (i.e. the URLs), the amount of time that each web page was displayed, the URLs typed into the address bar, the buttons pressed on the browser interface (e.g. the ‘Back’ button), and the links clicked. The total task time and the time to find each answer were also recorded. Before and after each task, a brief series of questions were presented that asked about the participant’s experience with the task and topic.

In the second session – held about one week after the first – the same set of 24 tasks were presented (in a different order), with instructions to refind *one* of the items found in

the first session. By instructing participants to refind only one item, refinding times can be compared across the tasks. Data collected for the second session was similar to that collected in the first session.

To collect the data for both sessions, a custom, instrumented web browser was written in Visual Basic (see Figure 1). This browser utilized the Microsoft Web Browser control to display the web pages, and included instrumentation to collect the data described above. The

browser also had an interface to display and collect answers to the tasks, and supported tabbed-browsing.

Phase Two – At the time of this writing, data collection for the second phase of the study had recently been completed. Eighteen participants returned for a third, final session that was similar to the second session. Participants were given the same set of 24 tasks and asked to refind the same items they found before. Data analysis has begun and I plan to report preliminary results at the workshop.

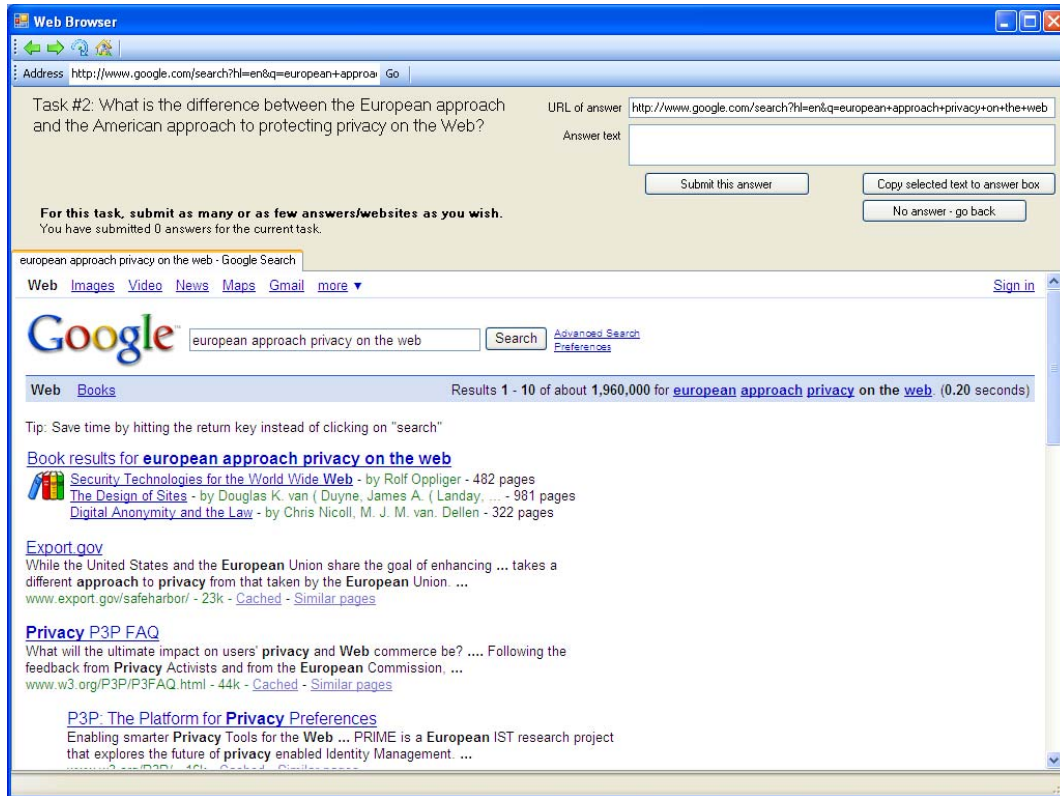


Figure 1. Custom Instrumented Web Browser Data Collection Tool

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