The Impact of Task on the Usage of Web Browser Navigation Tools

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ABSTRACT

The design and improvement of existing web browser navigation tools is often motivated by reports of high tool usage in the literature. However, general usage data alone is not enough to understand the utility of a given navigation tool. In this paper, we explore how factors such as task and individual differences influence the usage of different web browser navigation tools. We conducted a field study of 21 participants in which we logged detailed web usage and asked participants to provide task categorizations of their web usage based on the following tasks: Fact Finding, Information Gathering, Browsing, and Transactions. Using this data, we have identified three factors that play a role in the use of navigation tools: the task session, the task, and individual differences. These findings have implications for the future design of new and improved web navigation tools.

Author Keywords

Navigation, web browser tools, web usage, task, field study.

ACM Classification Keywords

H.5.4.m. Hypertext/Hypermedia: Navigation, User issues.

INTRODUCTION

Since its inception, the ways in which users interact with and navigate the Web have been shaped by the set of navigation tools provided by standard web browsers, such as back and forward buttons, bookmarks/hotlinks, history, and more recently, auto-complete and search toolbars. These tools allow users to access both new and previously viewed pages. Over the past 10 years, a number of focused studies have examined the use of new and improved navigation tools. However, these tools are typically studied in isolation and for a set of focused tasks. Throughout this paper, we refer to all methods of navigation, whether the result of a browser function (e.g., back button, history) or within a web page (e.g., hyperlinks) as web browser navigation tools.

At present, the research community has a general understanding of the usage frequencies of most web browser navigation tools. However, general usage frequency in itself does not provide a complete picture of the usefulness and effectiveness of a given tool. Factors such as task and individual differences may also play a role in the use of a tool. In order to design more effective navigation tools, it is important that designers and researchers have an understanding of the factors that influence the usage of a tool. For instance, when the reported usage of a tool is low, in comparison with the most commonly used tools, there may be several possible reasons: *Is the tool simply not effective? Is the tool only appropriate for certain tasks? Or is the tool preferred by a certain type of user?*

We recently conducted a field study in order to investigate information seeking behaviour on the Web. Over the course of the study, two main types of data were collected: task information and interactions with the web browser, which included the use of web browser navigation tools. Participants annotated their web usage with task information using an electronic diary and tasks were categorized as follows: Fact Finding, Information Gathering, Just Browsing, and Transactions. All interactions with the features of the web browser were automatically logged by a custom built web browser used by participants during the study. Using the data collected from this study, we have explored how participants use their web browser navigation tools in normal day-to-day web usage.

The key contribution of this paper is a characterization of the factors that influence the usage of web browser navigation tools. This understanding can be used to inform the design of future web browser navigation tools as well as improve existing tools. In the next section, we present an overview of the related work in the area. We then outline the methodology and data collection methods used during the field study. The results section presents three factors that are shown to be related to the use of web browser

navigation tools, followed by a discussion of our results. We then conclude with a brief overview of our future work.

RELATED WORK

Usage of Web Browser Navigation Tools
Despite the many modifications and new features introduced by web browsers, the primary methods of web navigation have remained relatively constant. Catledge and Pitkow [5] reported in 1995 that the two most commonly used methods of web navigation were hyperlinks (52%) and the back button (41%). In 1997, Tauscher and Greenberg [21], while studying the revisitation strategies of users, reported that hyperlinks accounted for 50% of all navigation and the back button accounted for 30%. In both studies, the individual use of all other navigation tools was less than 3%. Recent work by Milic-Frayling, Jones, Rodden, Smyth, Blackwell, and Sommerer [17] reported that 43% of all web navigation was a result of hyperlinks while the back button accounted for 23% of all navigation. The reported usage of other tools such as bookmarks, typed-in URLs, the home button, the refresh button, and the forward button, has been relatively minimal and each tool individually accounted for 0-3% all navigation.

Design and Evaluation of Web Browser Navigation Tools

Web page revisitation accounts for a large percentage of user's navigation [9; 21] and as such, much of the previous work investigating web browser navigation tools has centered on those that support both immediate and post-session revisitation [12]. The three most commonly studied web browser navigation tools are designed to support revisitation: back button navigation, bookmarks, and history. Less attention has been paid to navigation tools used for "new" navigation but new tools have recently emerged as web browser search toolbars (e.g., Google toolbar, Yahoo! Toolbar).

Research surrounding web browser navigation tools is often motivated by the consistently high reported use of the back button. Enhanced back navigation tools such as SmartBack [17] and gesture based back/forward navigation [19] have been evaluated with the aim of improving the speed and ease with which users can return to recently viewed pages. Other research has examined issues related to the back button's standard stack-based navigation model [8; 10].

The reported use of bookmarks in the literature has been relatively low, especially in comparison with back button and hyperlink usage. Although some enhancements to the bookmark tool have been evaluated [15], much of the bookmarks research has studied the information management issues associated with the collection and use of bookmarks [1; 4; 17].

The history function appears to be one of the least commonly used navigation tools [2; 21]. One of the biggest issues with the history is how to represent the large number of previously viewed pages in a way that is meaningful to users [3; 14]. Other more general tools have explored the integration of back navigation with bookmarks and history [7; 13].

METHODOLOGY

Study Population
Twenty-one university students took part in a one week field study held in March, 2005. Although 23 participants began the study, we were only able to analyze the data from 21 participants. One participant did not finish the study and a second participant's data was unusable because the task information was not properly annotated. In order to be eligible to participate, participants had to meet the following criteria: (a) laptop user, (b) user of Microsoft's Internet Explorer (IE), and (c) willing to have their web usage recorded during the study. Laptop users were recruited in order to capture the greatest amount of web usage and to facilitate installation of the custom software. Since we wanted to study participants' web usage in their natural environment (or as natural as possible) IE users were recruited because the custom web browser used during the study was a clone of IE. Students interested in taking part in the study completed a screening questionnaire to ensure they were qualified to participate.

Participants consisted of both graduate (15/21) and undergraduate (6/21) students. The academic background of the participants included Computer Science (11/21), Health Informatics (2/21), Management (4/21), Economics (2/21), Kinesiology (1/21), and general Arts (1/21). The median age category of the participants was 20-29 and the gender was almost evenly split with 12 males and 10 female participants. The median category of web usage reported by the participants was between 30-39 hours per week. Although students with a Computer Science background are typically considered to be more technical than others, all users were frequent web users and were the primary users of their laptops. Five participants also reported they used a desktop (either at home or work) for some of their web usage.

Instruments and Data Collection
During the course of the study we captured participants' web usage, task information, and questionnaire data. Capturing a detailed picture of participants' web usage can be difficult. We explored several commercial and academic software logging tools, however none of the standard logging solutions met all our needs. Therefore, we built a custom web browser (shown in Figure 1a) in C# using the browser control function provided by Microsoft .Net. The custom browser mimicked the appearance of IE, the functionality (including a Google search toolbar), and logged all usage. All history and bookmark files were shared between IE and the custom web browser, meaning that on the first day of the study, participants had full access to their recent history data and did not need to create new (or import) bookmarks. It was of critical importance that

participants used a familiar web browser, with all of their usual tools and this was reflected in the design of the custom web browser.

Task Information

Participants were asked to categorize their web usage based on the following five tasks:

1. Fact Finding – Looking for specific facts, files, or pieces of information.
2. Information Gathering – Collecting information, often from various sources, in order to make a decision, write a report, complete a project, etc.
3. Just Browsing – Viewing web pages, with no specific goal in mind, often just for entertainment.
4. Transactions – An online action, such as email or banking.
5. Other –Tasks that do not fit into any of the above categories.

In addition to task categorization, participants were also asked to provide a short textual description of the task (e.g., "reading the news", "looking for an email address"). Although Transactions and Other aren't classified as information seeking tasks, participants were still asked to categorize all web usage so that we could a gather a complete view of all web use.

The task categorization is based on previous studies of information seeking behaviour and web tasks [6; 18; 20]. We also conducted a pilot study and focus group to ensure that participants were able to categorize their web usage according to the categories provided. Six participants took part in a four day pilot study in which they used the custom web browser and categorized their web usage. The pilot study allowed us to refine the task categorization. We then conducted a 10 person focus group to further iterate on the tasks. The tasks that evolved out of this focus group were in fact very similar to the tasks reported in the literature but it was important to validate the tasks before commencing the field study.

Based on the results of the pilot study, where user preference was evenly split, participants were given the option to provide their task information in real-time using a task toolbar, at the end of the day using a task diary. Alternatively, participants could use a combination of both tools. Participants who preferred the toolbar method (shown in Figure 1b) were instructed to fill in task information at the beginning of a new task. An auto-complete function was implemented to help participants quickly input their task descriptions.

Participants who preferred to the use the task diary to assign task information (shown in Figure 1c) were instructed to do so at the end of each day. The task diary, similar to the
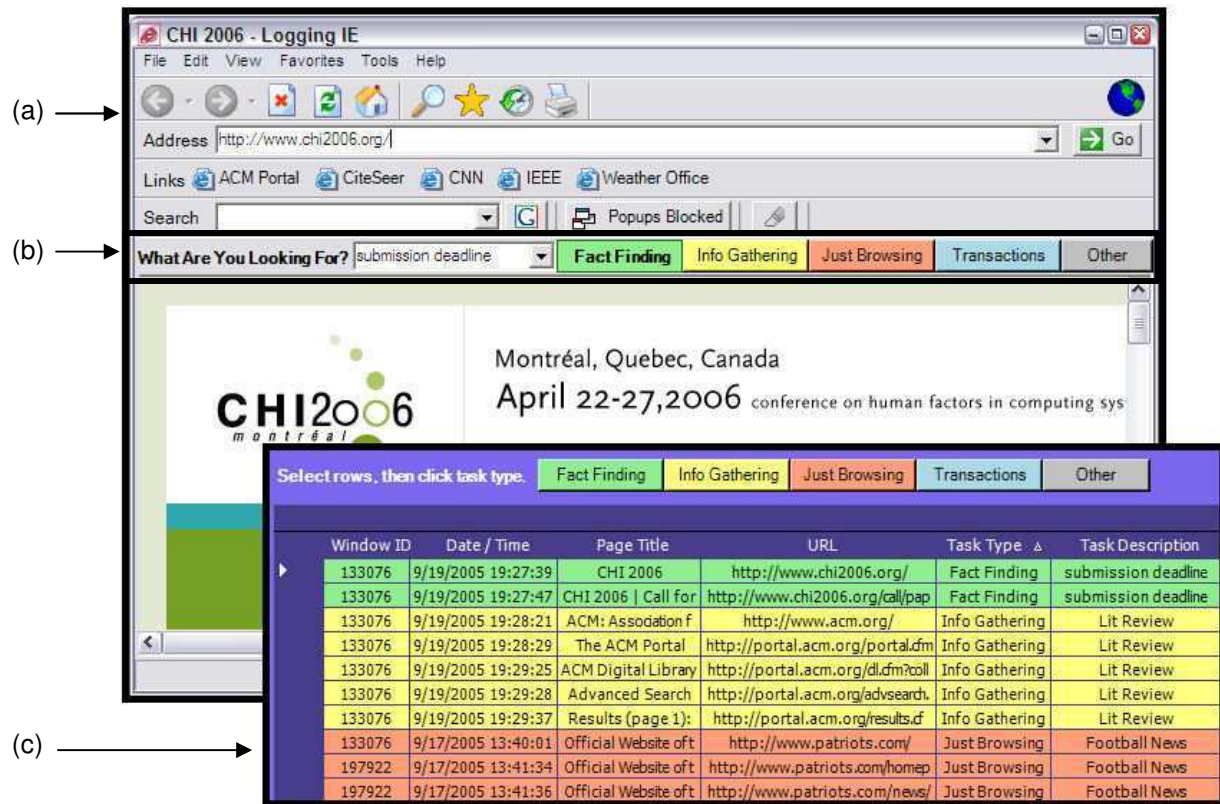

Figure 1. Our custom web browser (a) was built to mimic Microsoft Internet Explorer and provided a task toolbar (b) for participants to record their task information in real-time. Participations could also use the task diary (c) to record their task information at the end of each day.

approach used by Hawkey and Inkpen [11] to collect privacy information, allowed participants to assign task information to multiple URLs at once. As with the toolbar, an auto-complete function was implemented and was shared between the toolbar and the task diary. In an effort to encourage users to work on the Web as they normally would, all participants could use the task diary to delete URLs in which they were uncomfortable sharing with the researchers involved in the study.

Regardless of the method used to collect task information, each URL visited was associated with a task categorization and description. This information was recorded in a log file (logfile1) in the following format: window id, date & time, page title, URL, task categorization, and task description.

Upon completion of the study and before analysis of the data, a single researcher manually reviewed all participants' data. We encountered instances where the task information did not appear to match the URLs recorded. In many cases, participants had forgotten to update their task information as they switched to a new task. Only in cases where the behaviour was habitual and obvious, such as email, did the researcher alter the task information. In all other cases, the participants were contacted in order to clarify the task information.

Web Browser Navigation Tools
Overall, 15 navigation tools were logged by the custom web browser:

Auto-Complete	History
Back Button	Home Button
Back Menu	New Window
Hyperlinks	Other
Bookmarks	Reload Button
Forward Menu	Select URL
Forward Menu	Typed-in URL
Google Toolbar	

Usage categorized as "Other" consisted of navigation events for which the source could not be identified by the custom web browser. These events were typical within web-based email and other online applications, where pages are loaded by means of forms and JavaScript. Usage logged as New Window typically consisted of new windows initiated either by the user or automatically from a script. However, the custom web browser provided a pop-up blocker so pop-up advertisements likely did not account for much of the new window usage.

The navigation tool log data was recorded in a second log file (logfile2) in the following format: window id, date & time, task categorization, and task description. This log file did not contain URL information in case a participant choose to delete URL information in (logfile1) using the task diary. We also logged the use of browser functions, such as copy, paste, save, print, etc. The two log files were then merged before the analysis using timestamps.

Questionnaires
Participants completed three separate questionnaires over the course of the study. During the pre-study session, a background questionnaire was used to collect demographic information and perceived use of the web. Participants also completed a web browser tools inventory during the pre-study session to capture their perceived web browser tools usage. Upon completion of the study, participants completed a post-study questionnaire which examined any difficulties they encountered during the study.

Procedure
On the first day of the study, each participant met with the researcher administering the study for a one hour session in which the custom web browser and task diary were installed on the participant's laptop. The custom web browser was configured with the participant's current IE settings, such as the use of auto-complete, the bookmarks (Favorites) toolbar and the Google toolbar. The background and web browser tools inventory were both administered at this time.

The researcher then carefully described the different task categories and explained how to use both the task toolbar and task diary. Participants then took part in a short training exercise in which they practiced using both the toolbar and task diary methods of providing task information. Finally, participants were given printouts of the task definitions (also available online) and instructions for recording their task information.

Each participant was asked to email their data to the study researcher at the end of each day using a custom email application. This application emailed all new data, consisting of both log files (logfile1 and logfile2), to the researchers, ensuring that participants were correctly recording their data. Researchers contacted participants if more than two days passed without any data submitted to determine if there were any problems.

After a one week period, participants returned to meet with the same researcher. The software was uninstalled from the participant's laptop and all logging data was copied onto a backup disk (in case any emailed data was missing) and then deleted from the participants' laptop. Participants completed the post-study questionnaire and were paid $25 for their participation in the study.

RESULTS
In this section, we first present descriptive statistics describing the overall usage of navigation tools. We then explore how task and individual differences influence the use of different navigation tools.

General Usage
Over the week of the field study, participants viewed a total of 13498 web pages (mean = 642.8, range = 98-1733). Table 1 displays the overall usage of each tool across all participants. Overall, the most common methods of web

navigation were hyperlinks (41.7%), 'other' navigation (23.6%), and the back button (18.9%). These three navigation tools were used by all participants and together accounted for 84.2% of all navigation during the study.

The use of bookmarks (2.6%), the Google toolbar (1.3%), new window (5.2%), and typed-in URLs (4.5%) was relatively minimal, when compared with the above mentioned tools. In addition, we observed that several navigation tools accounted for less than 1% of all usage: auto-complete (0.9%), back drop-down menu (0.21%), forward button (0.7%), home button (0.1%), reload button (0.1%), and select URL (0.4%).

Task Sessions

We examined the use of navigation tools within the context of a task session. A task session was defined as a session of web use, annotated with the same task information. Similar to Catledge and Pitkow [5], a 25.5 minute period of

Navigation Tool	Total Usage	Task Session		Usage Among Participants
		New	Within	
Auto-Complete	120 0.9%	67.5%	32.5%	85.7%
Back Button	2545 18.9%	1.1%	98.9%	100.%
Back Menu	21 0.2%	0.0%	100.0%	33.3%
Bookmarks	356 2.6%	84.6%	15.4%	71.4%
Forward Button	88 0.7%	0.0%	100.0%	66.7%
Forward Menu	0	n/a	n/a	n/a
Google Toolbar	171 1.3%	63.2%	36.8%	76.2%
History	0	n/a	n/a	n/a
Home Button	13 0.1%	69.2%	30.8%	33.3%
Hyperlinks	5625 41.7%	1.7%	98.3%	100%
New Window	707 5.2%	12.7%	87.3%	90.5%
Other	3186 23.6%	1.5%	98.5%	100%
Reload Button	12 0.1%	25.0%	75.0%	28.6%
Select URL	53 0.4%	64.2%	35.8%	19.0%
Typed-in URL	601 4.5%	65.1%	34.9%	100%

Table 1. Displays the overall usage of each tool, percentage of new task session navigation, percentage of within task session navigation, and the percentages of participants who were observed using the tool.

inactivity was used to demarcate between session.

Overall, we observed a total of 1192 task sessions (mean = 56.8, range = 16-140).with the following breakdown: Fact Finding (18.3% - 218/1192), Information Gathering (13.4% - 160/1192), Browsing (19.9% - 237/1192), Transactions (46.7% - 557/1192), and Other (1.7% - 20/1192). Due to the relatively small number of task sessions classified as Other, we did not consider this task in our analysis.

At first glance, the usage frequencies of tools such as hyperlinks and the back button appear to dwarf the usage of other tools such as bookmarks and auto-complete. However, when we examined all navigation events in the context of a user's task session, we saw a division between two groups of navigation tools. The first group, which we refer to as New Task Session (NTS) navigation tools, were employed either when initiating a new task session or when changing navigation strategies within a session. The second group, referred to as Within Task Session (WTS) navigation tools, were used almost exclusively for navigation within a task session. For each navigation tool in Table 1, a breakdown of the tool's NTS and WTS navigation is shown.

New Task Session Navigation

Web browser navigation tools categorized as NTS navigation tools consisted of those commonly used to initiate a new task session: auto-complete, bookmarks, the Google toolbar, the home button, selecting a URL from the address bar drop-down menu, and typed-in URLs. The bar chart in Figure 2 shows the breakdown of usage for these tools.

Task sessions were initiated by one of these particular tools in 77.7% of all tasks. The overall use of these tools to initiate new tasks ranged from 64.2% (select URL) to 84.6% (bookmarks). The use of NTS navigation tools was not consistent across participants; the only NTS navigation
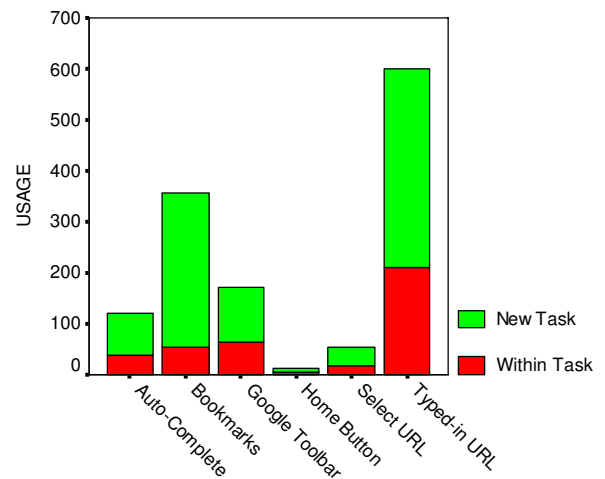

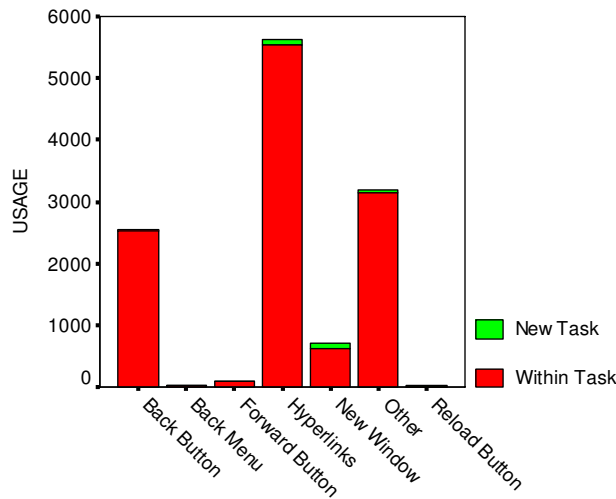**Figure 2. The breakdown of use for tools characterized as NTS navigation tools.**

Figure 3. The breakdown of use for tools characterized as WTS navigation tools.

tool used by all participants was typed-in URLs.

The NTS tools, when not used to initiate a new task session, were typically used within a session to either branch off to new websites (e.g., moving from one news website to another during a Browsing task) or to return to a previously visited page (e.g., returning to Google within a Fact Finding task).

Within Task Session Navigation
Tools used as WTS navigation tools consisted of the back and forward buttons and menus; hyperlinks; new windows; the reload button; and other navigation. These tools were used almost exclusively for navigation within a task session and accounted for 96.8% of all WTS navigation. We observed usage of the three main navigation tools (hyperlinks, back button, other) by all participants, which is not surprising given that hyperlinks are a fundamental
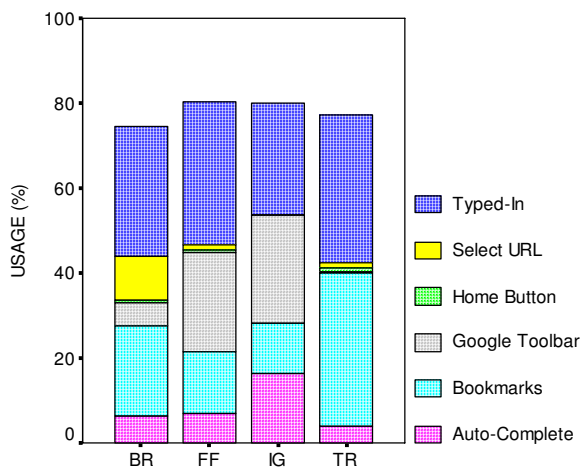
aspect of hypertext. The usage of each tool, for WTS navigation, ranged from 75% (reload button) to 98.9% (back button). The bar chart in Figure 3 shows the breakdown of usage for these tools.

Task
We investigated whether the type of task played a role in the use of navigation tools by examining the tools used to initiate and navigate within Fact Finding, Information Gathering, Browsing and Transaction task sessions. Figure 4 displays the proportions of tools used to initiate new task sessions.

With the exception of Transactions, the use of typed-in URLs was the most common method to initiate new tasks. Typed-in URLs were used to initiate 33.5% of Fact Finding tasks, 26.3% of Information Gathering tasks, 30.8% of Browsing tasks, and 34.8% of Transaction tasks.

Only used slightly more than typed-in URLs, bookmarks were most commonly used to initiate Transactions (35.9%).For Browsing tasks, the second most common tool was bookmarks (21.1%), followed by URLs selected from the drop-down address menu (10.1%). The Google toolbar the second most common way to initiate both Fact Finding (23.4%) and Information Gathering (25.6%) tasks.

Figure 5 displays the proportions of tools used to navigate within a task session. Navigation through interactions with the web page (i.e., hyperlinks, 'other', and new windows) was common across all tasks and was used to navigate within 73.6% of Fact Finding tasks, 63.4% of Information Gathering tasks, 73.4% of Browsing tasks, and 94% of Transaction tasks. Back button usage was highest (32.3%) within Information Gathering tasks and was greatly reduced within Transactions (4.5%).

Individual Differences
We investigated whether individual differences played a role in the use of NTS navigation tools. Using a K-Means

Figure 4. The proportion of navigation tools used to initiate a new task.
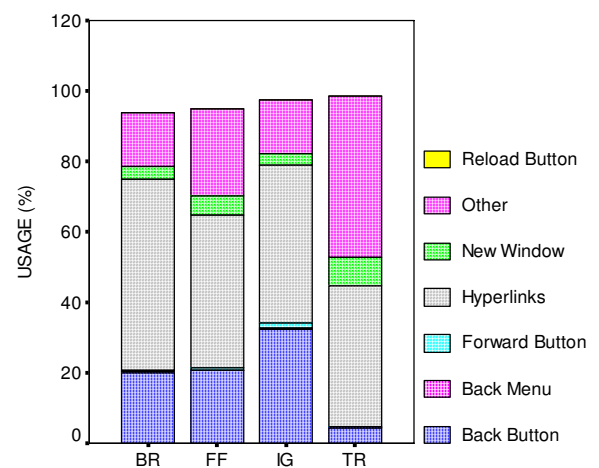

Figure 5. The proportion of navigation tools used to navigate within a task session.
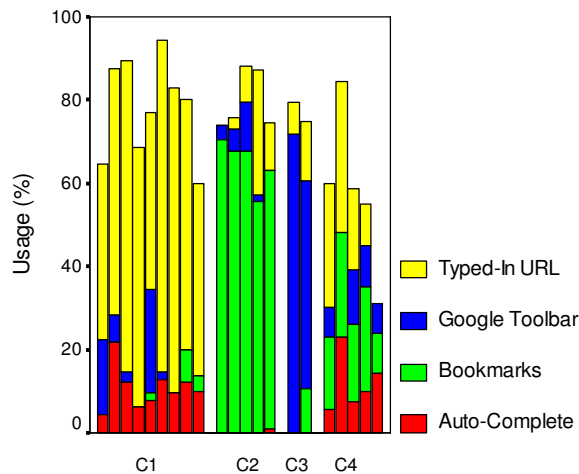
Figure 6. Participants were clustered according to their use of the four most frequently used tools for initiating a task session.

cluster analysis, participants were clustered based on their use of NTS navigation tools while initiating a new task session. Figure 6 shows the four resulting clusters. The first three clusters (c1, c2, c3), consist of 76.2% (16/21) of the participants, and represent those who appeared to have a dominant navigation tool. The remaining cluster consisted of the participants (23.9% -5/21) who did not display a dominant method of navigation.

The first cluster, made up of 9 participants, consisted of the group of participants who primarily choose to directly type-in URLs to initiate a new task session. The use of typed-in URLs for initiating a new task ranged from 42.2% to 80.0% across members of the cluster. All participants in this group were also users of the auto-complete function for navigation.

The second cluster, made up of 5 participants, consisted of those who primarily used bookmarks to initiate a new task session. The use of bookmarks for initiating a new task ranged for 55.7% to 70.5% across members of this group. This cluster differed from the other three clusters in that all of the members reported they did not use a secondary computer, meaning that frequent users of bookmarks did not move between machines. Participants were also very habitual in how they used their bookmarks. From this group, 4/5 participants used a single method to access their bookmarks (either through the side window, drop-down menu or links toolbar). This trend was found across all participants; 80% (12/15) of bookmark users chose a single method to access their bookmarks.

The third and smallest cluster was made up of simply 2 participants and consisted of those whose dominant method of navigation was the Google toolbar. The use of the Google toolbar for initiating a new task was 50.0% and 71.8%, respectively, for the two members of this group.

The fourth group, consisting of 5 participants, consisted of those participants who did not display a dominant method of navigation. Within this group, participants exhibited varied use of the navigation tools.

DISCUSSION

Based on the data collected during the field study, we have identified three factors that play a role in the use of navigation tools: task session, task, and individual differences.

Overall, we did not observe striking differences between the usage data we collected and that of previously reported data. However, it does appear that the use of hyperlinks and the back button have decreased since Catledge and Pitkow's [5] initial study.

We have identified two classes of web browser navigation tools: those used to start a new task (NTS) and those used within a task session (WTS). Although the NTS tools were more commonly used for initiating a new task, they were also used for some within task navigation. We observed very strong evidence that the WTS navigation tools were almost exclusively used for within task navigation.

This is an important finding for the designers and researchers of web browser navigation tools. We must consider whether usage of a tool is low simply because the class of tool exhibits lower relative usage or because the tool has an inherent flaw that discourages its use. For instance, when we compare the overall use of bookmarks (2.6%) with that of the back menu (0.15%) it appears that both tools are used infrequently. However, once we examine the tools in their proper context of use, we are able to gain a fuller understanding of their use. Within the context of a new task, bookmarks were the second most common method for initiating a new task and accounted for 25.3% of all new task navigation. Our participants commented that they used bookmarks because they were fast and easy to use. The back menu, a within task navigation tool, accounted for only 0.17% of all within task navigation. Participants reported they did not use this tool because it is easier to click the back button repeatedly and that it can be difficult to recognize the desired page from the list of pages in the drop-down menu. Three participants also reported they were not even aware of the functionality provided by this navigation tool. This example also illustrates how the ineffectiveness of one tool (the back menu) increases the usage of a related tool (the back button).

We observed which navigation tools were used by participants while engaging in Fact Finding, Information Gathering, Browsing, and Transaction tasks. The data collected suggests that the task at hand did influence the tools used to initiate new tasks. Although some tools, such as typed-in URLs were frequently used among all tasks, participants tended to also choose tools that supported the characteristics of the task at hand. For instance, Fact

Finding and Information Gathering tasks are often search-based, and this was reflected in the use of the Google toolbar, whose use was minimal among Browsing and Transactions. In [11], we report on how often different tasks were repeated (i.e., were reported more than once by a participant). Transactions, due to the large amount of email use, were the most often repeated tasks (95.2%), followed by Browsing (84.4%), Information Gathering (58.8%), and Fact Finding (55.5%). Tasks which were more often repeated exhibited a higher use of tools that support revisitation. Both Browsing and Transactions exhibited a higher use of bookmarks than the less often repeated tasks and we also observed the highest use of select-URLs during Browsing tasks.

While NTS navigation appears to be influenced by the type of task, we observed evidence that WTS navigation was sometimes influenced by content. Overall, the use of navigation tools for within task sessions was consistent across the four tasks. However, we observed a much lower use of the back button within Transactions. This can be attributed to the high use of web-based email and web-based applications which provide their own methods of navigation within the web pages.

We observed four main groups of users based on their choice of a dominant navigation tool for initiating new tasks. The first three groups consisted of those who consistently used typed-in URLs, bookmarks, and the Google toolbar. The fourth group consisted of those participants who used a variety of tools, with no one dominant tool.

Malone [16] observed individual differences in how people organize their information and classified people as either filers or pilers. Filers organize their information in a logical structure while pilers do not adhere to any structured organization. Teevan, Alvarado, Ackerman, and Karger [22] observed a similar distinction between users when observing their web and email search behaviour. Although further study is required, the use of navigation tools may be coupled with the way in which URLs and web information are stored and retrieved. For instance, bookmarks may be well suited for filers, while a searchable history may be more appropriate for pilers.

Study Limitations
Due to the exploratory nature of the study, a relatively small n, and the large number of comparisons required (potentially increasing Type I errors), we presented only descriptive statistics. This allowed us to explore an overview of the data and relative trends.

The set of participants who took part in this study consisted of students who were skilled and experienced web users. Although our sample population does not reflect the general population, the data collected was relatively consistent with previously reported data, which was conducted within
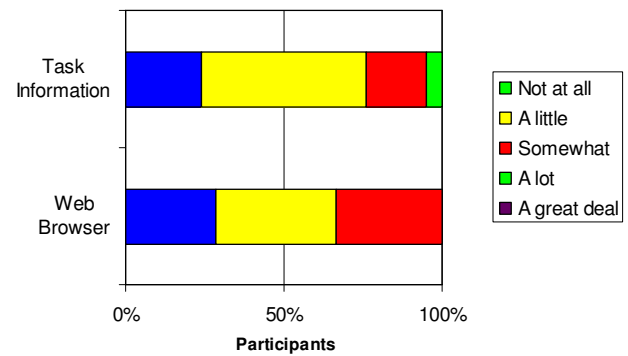

Figure 7. Likert scale responses to questions asking participants if having to record their task information and use a custom web browser impacted how they normally work on the Web.

academic populations [5; 21] as well as in workplace environments [17].

There were several trade-offs associated with the study design. A field study was chosen in order to obtain a relatively realistic view of the participants' habits and behaviours. This allowed us to observe participants working with their own navigation tools (bookmarks, history, toolbars, etc.) and undertaking tasks that were not motivated by a researcher. However, requiring users to annotate their web usage daily and use a custom web browser had the potential to reduce the naturalness for which we were striving. Also, it would not have been feasible for participants to provide detailed descriptions of the web usage for extended periods of time. Therefore, we elected to collect detailed task and behavioural information for a shorter duration of time.

Through the post-session questionnaires, we asked a series of Likert scale question aimed at understanding how the methodological decisions we made may have impacted participants' behaviour. Figure 7 displays the distribution for the responses. When asked if the web browser used in the study changed the way they usually work on the web, the median participant response was "a little". The median response for whether recording task information changed the way they usually work on the web was again "a little". From this data, we surmise that study requirements did not significantly impact participants' natural behaviour.

CONCLUSIONS AND FUTURE WORK
Logging task data to examine the usage of navigation tools is a largely unexplored resource for web tool designers. In this study we have provided an analysis of such logged data in which we included information about the task associated with individual web sessions. This analysis identified three factors that influence the selection of navigation tools by the users: task session, task type, and individual differences.

The usage of web browser tools depends on how the tool is used within a task session. Therefore, when assessing the

usefulness of a tool, overall usage may not be a reliable measure. It is important that navigation tools are evaluated in the proper context (i.e., NTS or WTS navigation tool). This categorization of tools allowed us to differentiate between tools that are frequently used as NTS navigation tools, such as bookmarks, typed in URLs, and the Google toolbar, versus those tools that are simply not being used in compared to their counterparts, such as the back and forward menus and history.

Participants tended to choose tools that supported the characteristics of the tasks in which they were engaged. Therefore, new and improved tools should consider the types of tasks in which users engage on the web and their characteristics. This also has implications for evaluations of these tools. In a laboratory setting, researchers need to carefully reflect upon the type of tasks participants engage while studying web browser navigation tools, as the choice of task may impact the observed use of a tool. It is also equally important that the results of all studies are viewed in light of the types of tasks in which the participants engaged.

Many participants did have a dominant, or preferred, navigation tool and we would like to better understand the qualities of the dominant tools that make them preferable. In our future work, we would also like to further examine the individual differences that exist between users, in terms of their preferred navigation tools and how strongly these differences influence their choice of navigation tools.

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