Drop-Down Democracy:
Internet Portal Design Influences Voters' Search Strategies

Scott P. Robertson
University of Hawaii
Info. & Comp. Sci.

Christine E. Wania
Drexel University
iSchool

George Abraham
Drexel University
iSchool

S. Joon Park
Drexel University
iSchool

scott.robertson@hawaii.edu, {christine.wania, george.abraham}@ischool.drexel.edu

Abstract

In this study we report how different interfaces for searching the internet changed the strategies and information opportunities of voters as they searched for political information. A drop-down interface that helped users define specific queries was compared to a traditional typed-query interface. The drop-down interface resulted in a broader set of information opportunities. Voters using the drop-down interface relied less on candidate websites, visited a broader sampling of website types, and examined issues more closely. Portal design heavily influences search strategies and information opportunities.

1. Introduction

1.1 Politics and the Internet

As the internet becomes more important in political campaigns, it is essential to understand how users search for information and inform themselves in anticipation of voting. In 2006, 60 million people in the United States (31% of the adult population) used the internet for some political purpose [1]. "Campaign internet users," as the Pew Internet and American Life Project labeled them [1], used the internet to find information about candidates, talk to others about political issues, and post and forward their own and other people's political commentary. An increasing number of campaign internet users are watching political and audio recordings on the internet and they are being pulled away from traditional sources of information such as television and radio.

Table 1 shows the percentage of campaign internet users who reported getting information from various internet sources. Politicians and political organizations are responding by increasing their presence on the internet and

60%	News portals
60%	TV network websites
48%	Local news organizations' websites
31%	Websites of major national newspapers
28%	State or local government websites
24%	Issue-oriented websites
20%	Blogs
20%	International news orgs' websites
20%	Websites created by candidates
19%	News satire websites
19%	Websites of radio news organizations
10%	Websites of alternative news orgs
10%	Email listervs

Table 1. Sources of information for campaign internet users (from [1]).

using more diverse internet resources such as blogs and virtual meeting spaces.

It is not clear how campaign internet users find the information sources that they eventually use, but it is reasonable to assume that, like most internet users, they take advantage of search tools such as Google or Yahoo. As voters move to the internet, they have to figure out how to construct good queries and understand how to browse and filter query result lists. In our study, we examined how people in a mock voting situation approach query construction, result list consideration, and website browsing. We tested a novel front-end to a search tool that was designed to help users formulate better queries by taking advantage of recognition memory and forcing more specific searches.

1.2 Searching the Web

Large scale studies of search tool users have shown that people are generally not sophisticated

searchers. Spink, Wolfram, Jansen, & Saracevic [2] studied over one million queries by users of Excite and found that they tended to create queries with an average of only 2.16 terms. A study of over one billion AltaVista queries [3] similarly found that searchers created short queries (2.35 terms on average) and rarely modified their queries.

Query length and complexity, however, have been shown in a variety of studies to vary with searcher experience and domain expertise [4][5][6]. Holscher and Strube [7] found that search experts created longer queries than average users (3.64 terms versus 1.66 terms, respectively). In a second study they showed that experts in the search domain used shorter queries than domain novices (1.96 versus 2.96 terms, respectively) and conjectured that domain experts can be more focused and accurate.

Once users formulate a query, they are faced with the task of browsing the results. There are many browsing and information seeking strategies that users employ [8][9], and they vary depending on how directed searchers are [10], how much they integrate browsing and searching [11][12], how comprehensive they wish to be in their understanding of the domain [13][14], their intended use of the information [15], and even how the information influences searchers' affective state [16].

1.3 Political Information Seeking

Voters have some special information needs and they are exploring a unique information space [17][18][19]. Voters are typically in "decision-making mode," and some models of voter information browsing stress this aspect by suggesting that voters are updating checklist schemas about candidates ("online model") as opposed to trying to learn all they can about the

candidates [27]. Voters are faced with juggling many different types of information such as advocacy and issue-oriented information, persuasive and argumentative content, opinion, news and other media [20].

There have been a number of studies that examine voters' political information seeking behaviors [21] or that ask voters questions about their political information seeking behaviors on the web [23], although these studies do not look directly at voters searching freely for information on the internet. Redlawsk and Lau [17][18][19] used a dynamic information board in which information flows over time in order to simulate the random and haphazard encounters with information that many voters experience as a campaign progresses. While this is an important type of information experience for voters, as they turn more and more to the internet they will become more in charge of their information exposure and they will be exposed to many different types of information that may not have been available in the past [1]. Researchers need to understand how voters will *seek* and *filter* information, how they utilize information that they obtain *actively*, and what they remember from such information encounters.

1.4 Drop-Down Recognition Searching

In several studies, we have been examining how voters search the internet for information about how to vote [24][25][26]. We are interested in how various information technologies might fit into different aspects of voters' decision-making processes and how a thorough understanding of voter decision-making processes could guide the design of voter portals [25]. New candidates and ballot issues present voters with the problem of searching in a domain where their knowledge is limited. In typed-query search environments like Google,
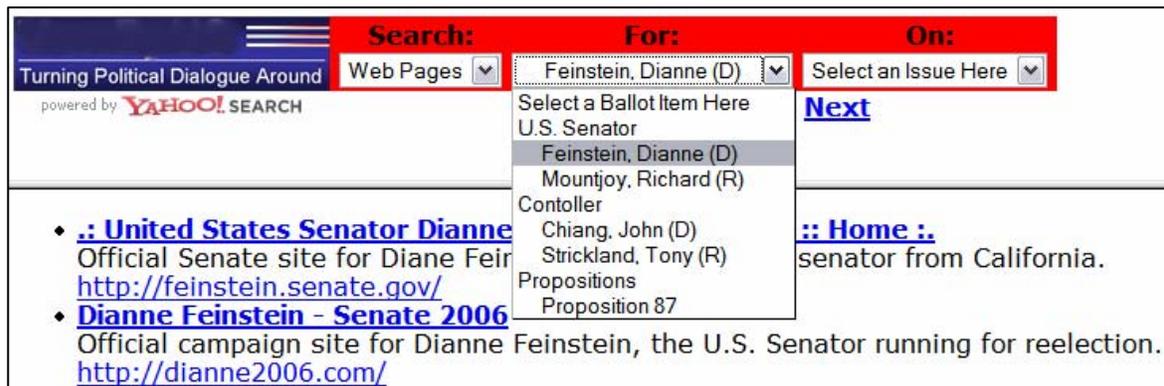

Figure 1. The drop-down search interface allowed users to select ballot items.

Yahoo!, and most other search tools, voters must generate queries based on their own knowledge of the ballot and election issues.

In this study, we were interested in examining whether the search tool itself could help users to formulate more targeted searches that produce more relevant results. Following from an earlier study in which ballot items served a dual purpose of reminding voters of the candidates and issues and serving as navigation aids [25], we designed an interface in which ballot items appeared in a drop down list and, when selected, automatically initiated internet searches (Figure 1). Our interface also included a list of 24 issues in another drop-down list (Figure 2) and the option of viewing Web Pages or News in another drop-down list. Users could combine the three boxes to create specific searches such as web pages on "Dianne Feinstein and taxes." In the background the search tool also added more specific terms to the search (e.g. "Senate and California" in the example above).

We were interested in examining how the recognition-based, drop-down interface might change users' search strategies. We hypothesized that users might perform more searches and more issue-based searches if they were prompted by the drop-down menus.

Following Lodge [27, 28] and Huang & Price [15], we also contrasted conditions in which subjects were told that they would actually vote with conditions in which subjects were told that they needed to "learn as much as possible" about candidates in order to interview them later. Voting is often associated with "impression formation" tasks and is considered to be less cognitively challenging than an explicit learning task. Huang & Price [15] showed that subjects forming impressions were less likely to do within-candidate searching.

2. Method

2.1 Participants

Twenty-nine participants were recruited, using information flyers, from areas around Drexel University in Philadelphia, PA. Data was collected from August 10, 2006 to November 2, 2006. Each participant was paid $35 for their time. The participants ranged in age from 18 to 58, with a mean age of 29 years old. Three participants identified themselves as Republicans, 11 as Democrats, 8 as independents, 2 as socialist, and 3 as "other." Seventeen participants had a four year degree, 5 had a Graduate degree, 1 had a Doctorate, 1 had a two year degree, and 1 had a high school degree.

2.2 Procedure

The independent variables were S*earch Interface* (*Drop-Down* interface versus *Traditional Query* interface) and *Information Task* (*Voting* versus *Non-Voting*). Participants were randomly assigned to one of the four groups created by the 2x2 pairing of the independent variables. All participants were given a scenario and instructions on how to use the search interface. The scenarios asked

Figure 2. The drop-down search interface allowed users to select issues.

3

subjects to imagine that they had just moved to California and that an election was coming up.

In the *Non-Voting* scenario, participants were told that they were journalists, that they would be "interviewing some local political figures in addition to some experts in the area of a proposition," and that they should "learn as much as you can about the candidates and the proposition so that you will be able to thoroughly interview each participant and mediate the conversations." In the *Voting* scenario, participants were told that they were going to "vote for one candidate for controller, one candidate for senate and yes or no for one proposition" and that they should "find information to help you make voting decisions."

Participants used either the Yahoo! search engine's traditional interface or the drop-down interface depicted in Figures 1 and 2 (which obtained results from the Yahoo!).

All participants were informed that there were two candidates for U.S. Senate: Dianne Feinstein and Richard Mountjoy; two candidates for California Controller: John Chiang and Tony Strickland; and one proposition: "Proposition 87 – Alternative Energy Research, Production, Incentives, Tax on Oil. Initiative Constitutional Amendment and Statute." These were actual ballot items in a current election at the time the study was conducted.

While carrying out the tasks described in the scenario participants were encouraged to think aloud. Software was used to capture and integrate the search behavior and verbalizations of the each participant. An experimenter remotely tagged the capture file while the participant was searching for information. These tags were adapted from a previous study we conducted on online political information seeking behavior [26].

At the end of the experiment, regardless of the group assignments, participants were asked to vote. They were also asked to provide a free recall for each ballot item and answer some debriefing questions.

3. Results

In this section we report results of several dependent measures. In all cases where means are reported, we performed a 2x2 analysis of variance (ANOVA) using *Search Interface* and
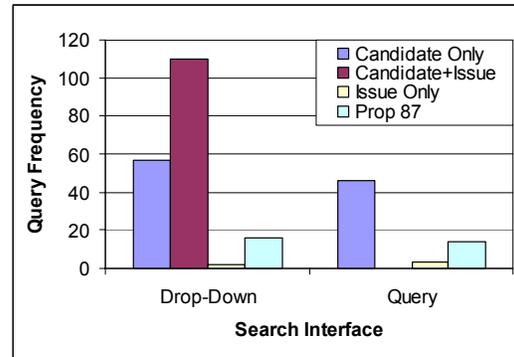
Figure 3. Number of queries of different types for each interface

Information Task as the independent variables.

3.1 Queries

Subjects made 356 queries overall. Out of all queries, 103 (30%) consisted of a candidate's name only (e.g. "Diane Feinstein"), 110 (31%) consisted of a candidate's name and an issue (e.g. "Diane Feinstein taxes"), and 5 (1.4%) contained only issue information. Out of the 138 remaining queries, 39 (11%) contained combinations of the candidate name and proposition name, or office, or other candidates; 65 (18.25%) contained just the proposition name and its variants, e.g. "CA and Prop 87", or the full name of the proposition; 21 (8.7%) were comprised of the state name, office, or a combination of both; and 13 (3.7%) were general queries.

It was possible to make four types of queries using either interface, specifically: candidate-only, candidate-plus-issue, issue-only, and proposition-name (other query types were possible only in the query interface). Figure 3 shows the number of queries observed of each of the four types possible in both interfaces for users of the drop-down interface and traditional query interface. The distribution of these four query types was significantly different across the two interfaces, $x^2(3)=67.93$, $p<.01$, with the drop-down interface resulting in many more candidate-plus-issue queries. The distribution of query types was not significantly different across the two voting conditions.

There was an average of 12.31 unique queries observed per subject. There was a marginally significant interaction between the voting and search interface conditions (Figure 4), with voting subjects making more queries when they were using the drop-down interface and non-voting subjects making more queries when they

4

were using the query entry interface, $F(1,28)=3.37$, $p<.08$.

Subjects revisited previous queries an average of 9.59 times, but users of the query interface revisited previous queries considerably more than users of the drop-down interface (13.71 versus 5.73 revisits, respectively), $F(1,28)=10.08$, $p<.01$.

The average length of queries was greater for the traditional query interface versus the drop-down interface (3.07 versus 2.50 words, respectively), $F(1,28)=6.61$, $p<.01$, although it is important to remember that query length was not under the direct control of subjects using the drop-down interface.

3.2 Time, Number of Visits, and Information Opportunity

Subjects spent an average of 42min,10sec on the entire task, and this did not differ across conditions. The total time can be partitioned into mean time entering queries (1min,36sec), mean time viewing results lists (5min,12sec), and mean time browsing websites (30min,41sec) (the remaining 5 minutes or so is time spent in activities unrelated to the task such as asking questions, taking breaks, etc.). Time spent looking at websites and results lists did not vary across conditions, however there was an interaction between conditions for the time spent entering queries, $F(1,28)=4.37$, $p<.05$. As Figure 5 shows, voters spent a greater amount of time in the query entry phase when using the drop-down interface, but nonvoters spent a greater amount of time in the query entry phase when using the traditional query interface. This mirrors the results for number of unique queries in Figure 4.

By far the largest percentage of subjects' time (73%) was spent browsing websites. We grouped the types of websites that subjects

looked at into the following seven categories, and here we also report the proportion of total website browsing time spent in each category:

- **Candidate Websites (28%)**: Official website of the candidate, e.g. www.chiangforcalifornia.com
- **Government Websites (19%)**: Official U.S. government websites with URLs ending with dot (.) gov, e.g. www.ca.gov
- **Political Organizations (18%)**: websites that either reflect party lines e.g. www.freerepublic.com (conservative) or take a clear stance on issues, e.g. www.prolife.com
- **News (7%)**: Websites hosted by popular news agencies, e.g. www.nytimes.com, www.cnn.com
- **Voter Guides (6%)**: Portals created to consolidate and deliver factual information about the election and candidates, e.g. www.vote-smart.org
- **Wikipedia (6%)**: Online peer-reviewed and authored encyclopedia at http://en.wikipedia.org
- **Blogs (5%)**: Personal blogs hosted by individuals about elections, proposition, and candidates; not part of candidate sites or political organizations.
- **Other (9%)**: Websites that were not related to the task but show up in the results because of similar distribution of keywords, basically noise.

We also examined the number of websites of each category that were *available* to subjects in their results lists across the conditions. On each results page that a subject looked at we recorded the number of items that were visible (more if the participant scrolled). We describe this as "information opportunity." The proportion of websites visited relative to the information opportunity was also calculated for each website type.
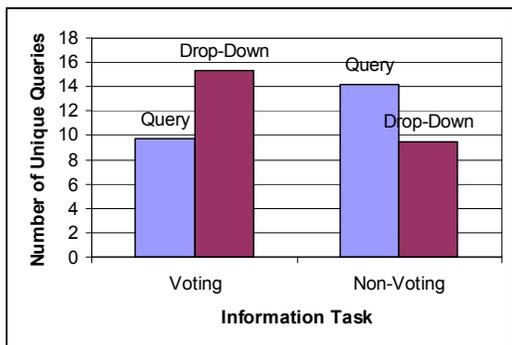

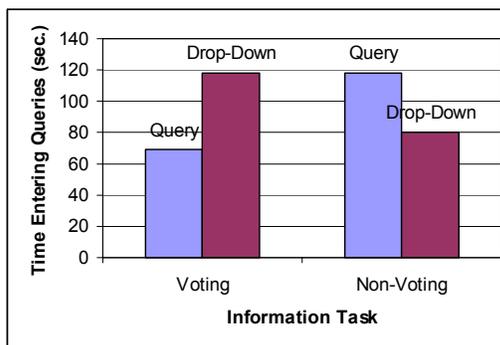**Figure 4. Number of unique queries**

Figure 5. Time spent entering queries

3.2.1 Candidate Websites

The drop-down interface generated more opportunities to view candidate websites than the query interface (12.73 versus 5.29 opportunities, respectively), $F(1,28)=20.47$, $p<.01$. Drop-down interface users looked at a smaller proportion of available candidate websites than query interface users (.28 versus .87, respectively), $F(1,28)=5.61$, $p<.05$. Subjects using the drop-down interface revisited candidate websites fewer times than subjects using the query interface (4.66 versus 9.18 revisits, respectively), $F(1,28)=12.64$, $p<.01$, and subjects using the drop-down interface spent half as much time overall at candidate websites than subjects using the traditional query interface (6.6 min. versus 12.01min., respectively), $F(1,28)=7.87$, $p<.01$.

3.2.2 News

The drop-down interface offered more opportunities to view news items than the query interface (27.6 versus 15.0 opportunities, respectively), $F(1,28)=4.03$, $p<.05$. This did not result in a difference in the number of visits or revisits to news sites, however subjects using the drop-down interface indeed spent more time at news sites than subjects using the query interface (3.07 minutes versus 1.21 min., respectively), $F(1,28)=4.14$, $p<.05$.

3.2.3 Voter Guides

The drop-down interface offered more opportunities to view voter guides than the query interface (14.40 versus 5.86 opportunities, respectively), $F(1,28)=7.85$, $p<.01$. Subjects using the drop-down interface viewed voter guides more than subjects using the query interface (2.0 versus .79 times, respectively), although the result was marginally significant, $F(1,28)=3.43$, $p<.08$. Also, subjects using the drop-down interface spent more time with voter guides overall than subjects using the query interface (3min. versus 42sec. respectively), although the result was also marginally significant, $F(1,28)=3.13$, $p<.09$.

3.2.4 Political Organizations

The drop-down interface offered more opportunities to view political organization sites than the query interface (28.27 versus 16.71 opportunities, respectively), $F(1,28)=4.77$, $p<.05$. Subjects using the drop-down interface looked at a larger proportion of available political organization websites than users of the query interface (.29 versus .12, respectively), $F(1,28)=6.41$, $p<.05$. Subjects using the drop-down interface viewed political organization websites more than subjects using the query interface (6.4 times versus 2.0 times, respectively), $F(1,28)=10.18$, $p<.01$. Subjects using the drop-down interface spent more time at websites of political organizations than subjects using the query interface (7.43 minutes versus 3.77 min. respectively), $F(1,28)=4.65$, $p<.05$.

3.2.5 Government Websites

There were no significant effects involving government websites of either the interface or voting variables with regard to information opportunity, number of visits or revisits, or time spent.

3.2.6 Wikipedia

Subjects who were not voting had a tendency to revisit Wikipedia more then subjects who were voting (2.07 times versus 0.47 times, respectively), $F(1,28)=3.89$, $p<.06$.

3.2.7 Blogs

Although the average number of blog visits was very low (1.52 visits per subject), a marginal interaction suggested that there was a tendency for subjects to spend more time in blogs when they were not voting and using the traditional query interface, $F(1,28)=3.49$, $p<.07$. Subjects using the query interface spent and average of 28sec. looking at blogs when voting but 3min.32sec. when not voting. In contrast, subjects using the drop-down interface spent and average of 1min.34sec. looking at blogs when voting but 58sec. when not voting.

3.2.8 Other Websites

The query interface offered more opportunities to view other websites not related to the election, although the difference was not significant. There was a corresponding tendency for users of the query interface to spend more time at websites in the "Other" category then users of the drop-down interface (4min.8sec. versus 1min.32sec., respectively), $F(1,28)=3.49$, $p<.07$.

3.3 Use of the Results Page

We counted the number of times subjects jumped to a web page from the results list and from another web page. We conducted a 2x2x2 mixed design ANOVA using origin of a hypertext jump (results list versus web page) as a repeated measures factor and voting condition and interface condition as between-subjects factors.

Subjects relied heavily on the results list to find new web sites rather than following links between web sites. On average, subjects jumped to 20.97 web sites from the results page but only 1.90 web sites from other web sites, $F(1,25)=98.99$, $p<.001$. A significant interaction between search method and origin of the hypertext jump indicated that the number of jumps from the results list differed depending on the type of interface being used, $F(1,25)=8.46$, $p<.01$. Subjects jumped to web sites from the results list an average of 15.93 times when using the query interface and 25.67 times when using the drop-down interface, but the small number of jumps between pages was the same for both interfaces.

3.4 Candidate-Centered versus Issue-Centered Searching

We examined sequences of search query terms in order to determine if participants tended to do a lot of candidate switching or to stay with one candidate at a time and look at issues relevant to that one candidate. Candidate switching was indicated when participants made sequential queries consisting only of different candidate names. Issue switching within candidates was indicated when participants first searched a candidate name and then followed it by adding an item to the name and executing a second query.

Users of the drop-down interface performed much more issue switching within candidates than users of the query interface (6.73 versus 1.57 instances, respectively), $F(1,28)=5.31$, $p<.05$. There was no difference between interface conditions in terms of the amount of candidate switching, however non-voting subjects did more candidate switching than voting subjects (4.43 versus 2.93 instances, respectively), $F(1,28)=4.09$, $p<.05$.

Payne [22, 29] describes an index to measure how much a person is candidate-centered versus issue-centered when browsing websites. We adapted this index to characterize search strategy by calculating the following ratio:

$$\frac{(\text{Issue Switches}) - (\text{Candidate Switches})}{(\text{Issue Switches}) + (\text{Candidate Switches})}$$

The index ranges from -1 for searches consisting of all candidate switches to +1 for searches consisting of all issue switches. Subjects using the drop-down interface tended to do both types of searches whereas subjects using the query interface tended to be candidate switchers (indices = 0.00 and -0.45, respectively), $F(1,28)=4.80$, $p<.05$.

3.5 Comments

While searching and browsing, the subjects were encouraged to think-aloud which resulted in 2080 individual comments. The comments were coded into 10 categories (adapted from [26]) by two coders independently. Cohen's Kappa for assessing inter-coder reliability was initially 0.52, which translates to moderate agreement [30]. The coders reconciled differences and eventually assigned each comment to a final category as follows:

- **Goal (11%)**: A statement about what the participant plans to do, e.g. "I would like to find a government website that explains what the proposition is."
- **Action (6%)**: A statement describing what the participant was doing , e.g. "I'm checking wiki."
- **Question (3%)**: An interrogative statement, e.g. "Who is endorsing him?"
- **Evaluative General (18%)**: A general evaluative remark but not related to the ballot item, e.g. "I don't see anything helpful so I'll search for others."
- **Evaluative about a ballot item (16%)**: Evaluative comment but cannot be determined positive or negative about the ballot item, e.g. "It looks like he is more popular because he has a double digit lead" OR "This (prop87) may be better for researchers but maybe not for consumers."
- **Positive about a ballot item (6%)**: A good evaluative comment in support of the ballot item, e.g. "I get a good vibe from him, I'd vote for this guy."
- **Negative about a ballot item (4%)**: A bad evaluative remark about the ballot item, e.g. "I don't like this guy, I can't find anything about his stance on issues."
- **Fact Discovery (16%)**: A statement of a non-evaluative piece of information about one of the candidates, e.g. "He served in the Navy"
- **Issue (7%)**: A statement about a particular political issue , e.g. "She combats crime, violence, cancer."
- **General Statement (13%)**: A non-evaluative comment not specifically about a candidate, e.g. "I don't really follow politics."

Subjects using the query interface made more

evaluative comments than subjects using the drop-down interface (30.93 versus 18.8 comments, respectively), $F(1,28)=5.30$, $p<.05$.

Subjects made more positive comments about the ballot items when they were voting compared to not voting (6.4 versus 2.0 comments, respectively), $F(1,28)=4.75$, $p<.05$. They also made twice as many negative comments about ballot items when they were voting compared to not voting (4.27 versus 2.07 comments, respectively), although this difference was not statistically significant.

Subjects asked more questions when they were not voting versus voting (3.43 versus .8 questions, respectively), $F(1,28)=10.12$, $p<.01$.

3.6 Recall
Overall, subjects recalled an average of 15.0 total items and their recalls did not vary across voting or interface conditions.

3.7 Summary of Results

3.7.1 Information Task
In contrast to the non-voting subjects, subjects who thought they were voting:

- Asked more questions while browsing
- Showed less candidate switching in their query patterns
- Made more positive and negative comments about the candidates and issues while browsing
- Visited Wikipedia less often

This is consistent with a view that the task of deciding who to vote for is more evaluative, more specific, less fact-oriented, and less generalized. The larger number of questions, the tendency to explore more within each candidate site, and the relative lack of interest in Wikipedia suggest that search is more directed for voters as opposed to more generalized for non-voters.

3.7.2 Search Interface
In contrast to the query interface, subjects using the drop-down interface:

- Made shorter queries
- Made many more candidate-plus-issue queries
- Spent longer in the query formulation and entry phase when voting (less time when not voting)

- Had more opportunities to view candidate websites but actually viewed a smaller proportion of what was available
- Had more opportunities to view political organization websites and took advantage of that by actually viewing a greater proportion of what was available
- Used the results list more to jump to websites
- Showed more issue switching within candidates and a balanced use of candidate switching and issue switching in their query patterns.
- Revisited previous queries less
- Returned to candidate websites less often and spent half as much time at them
- Spent more time at news sites
- Viewed voter guides more often and spent more time with them
- Viewed websites of political organizations more often and spent more time with them
- Spent less time in websites unrelated to the election issues
- Made fewer evaluative comments

The results are consistent with the view that the drop-down interface allowed subjects to make more focused searches. The longer time spent in query formulation by voters using the drop-down list reflects time spent browsing the issues and deciding which ones to select. The drop-down interface provided a recognition list of items that helped subjects think of issues to explore.

The results are also consistent with a view that the drop-down interface resulted in less reliance on candidates' own websites to gain information and guide search. The drop-down interface gave voters more opportunities to view information from media, political organizations, and non-aligned voter organizations, and voters took these opportunities. Once drop-down interface users began exploring non-candidate information sources, they spent relatively more time with them and less time at irrelevant websites.

Although we have no direct measure, the fact that subjects went to many more websites from the results pages in the drop-down condition than the query condition suggests that the results obtained from the drop-down interface may have been more interesting and relevant than the results obtained using the query interface.

4. Discussion

Our results demonstrate that the form of a search portal can have dramatic effects on what a voter is exposed to and how he or she searches. Voters using a traditional query interface generate impoverished queries consisting essentially of the candidates' names. They consequently generate a single result set for each candidate and use these single sets as their points of entry to the internet. Candidate websites are naturally high in the result lists and are often used as the organizing point for finding further information. The overall strategy of these users is candidate-centered.

In the drop-down interface condition, voters had the option of simply choosing the candidate name and searching the same way as query-interface users. However, the presence of the issue drop-down list prompted them to make more queries and be more specific. This in turn generated many different result lists for each candidate and provided many more information opportunities. Voters in this condition wound up relying less on candidate websites and sampling a broader variety of other types of websites, especially news, voter guides, and political organizations. They changed the queries frequently, returned to the results sets often, and spent more time considering what to look at. These users demonstrated a balance of both candidate-centered and attribute-centered search strategies.

Our results leave us with many questions. First, how malleable are search strategies? Huang & Price [15] demonstrated that candidate-centered and attribute-centered searching can vary as a function of searchers' goals, and our results further suggest that voters will switch strategies depending on the characteristics of the search tool.

Second, how far should search aids go in restructuring searchers' queries? We chose to add terms to the query that users constructed using the drop-down interface in order to make them more specific and targeted, but users were not aware of this added specificity. Should users be aware of the exact query that is being generated and should they have the option to change it? What dangers are there in adding terms and not making them visible to users? To what degree would seeing and being able to change automatically-generated queries help voters learn?

Third, to what degree should designers choose the items that will be available in a search interface aid? Should the items be customizable by users, how would this change their search strategies, and how would novices and experts differ in their ability to personalize?

Finally, who would benefit from front-end "query prostheses" such as the one studied here, and who would be hindered? What other enhancements to search tools would be beneficial in the context of voting and democratic deliberation? Our users' informal comments, for example, suggested that they would like to see categorized results sets and be able to perform "who's for and who's against?" searches.

It is important for developers of tools in this area to understand how they are influencing the goals, actions, information opportunities, and ultimate decisions that voters make.

5. Acknowledgement

6. References

[1] L. Rainie, M. and J. Horrigan, "Election 2006 Online," Pew Internet and American Life Project, 2007. http://www.pewinternet.org/pdfs/PIP_Politics_2006.pdf

[2] A. Spink, D. Wolfram, M. B. J. Jansen, and T. Saracevic, "Searching the Web: The Public and Their Queries," *Journal of the American Society for Information Science and Technology.,* vol. 52, 2001, pp. 226-234.

[3] C. Silverstein, H. Marais, M. Henzinger, and M. Moricz, "Analysis of a Very Large Web Search Engine Query Log." *ACM SIGIR Forum,* vol. 33, 1999, pp. 6-12.

[4] I. Hsieh-Yee, "Effects of Search Experience and Subject Knowledge on the Search Tactics of Novice and Experienced Searchers," *Journal of the American Society for Information Science,* vol. 44, no. 3, 1993, pp. 161-174.

[5] A. G. Sutcliffe, M. Ennis, and S. J. Watkinson, "Empirical Studies of End-User Information Searching," *Journal of the American Society for Information Science,* vol. 51, no. 13, 2000, pp. 1211-1231.

[6] W. Lucas and H. Topi, "Form and Function: The Impact of Query Term and Operator Usage on Web Search Results," *Journal of the American Society for*

Information Science & Technology, vol. 53, no. 2, 2002, pp. 95-108.

[7] C. Holscher and G. Strube, "Web Search Behavior of Internet Experts and Newbies," *Proceedings of the 9th International World Wide Web Conference on Computer Networks: The International Journal of Computer and Telecommunications Networking,* 2000, pp. 337-346.

[8] T. D. Wilson, "Models in Information Behaviour Research," *Journal of Documentation,* vol. 55, no. 3, 1999, pp. 249-270.

[9] B. J. Jansen and U. Pooch, "A Review of Web Searching Studies and a Framework for Future Research," *Journal of the American Society for Information Science & Technology,* vol. 52, no. 3, 2001, pp. 235-246.

[10] G. Marchionini, *Information Seeking in Electronic Environments.* Cambridge University Press, 1995.

[11] M. J. Bates, "The Design of Browsing and Berrypicking Techniques for the Online Search Interface," *Online Review,* vol. 13, no. 5, 1989, pp. 407-424.

[12] C. W. Choo, B. Detlor, and D. Turnbull, "Information Seeking on the Web: An Integrated Model of Browsing and Searching," *First Monday*, vol. 5, no. 2, 2000.
http://firstmonday.org/issues/issue5_2/choo/index.html

[13] B. Dervin and B. Nilan, "Information Needs and Uses," *Annual Review of Information Science and Technology,* vol. 21, 1986, pp. 3-33.

[14] N. J. Belkin, "Anomalous States of Knowledge as a Basis for Information Retrieval," *The Canadian Journal of Information Science,* vol. 5, 1980, pp. 133-143.

[15] L. Huang and V. Price, "Motivations, Goals, Information Search, and Memory about Political Candidates," *Political Psychology,* 2001, vol. 22, no. 4, pp. 665-692.

[16] C. C. Kuhlthau, "Inside the Search Process: Information Seeking from the User's Perspective," *Journal of the American Society for Information Science,* vol. 42, no. 5, 1991, pp. 361-371.

[17] R. R. Lau and D. P. Redlawsk, *How Voters Decide: Information Processing in Election Campaigns*, Cambridge University Press, 2006.

[18] D. P. Redlawsk, "What Voters Do: Information Search During Election Campaigns," *Political Psychology,* vol. 25, no. 4, 2004, pp. 595-610.

[19] D. P. Redlawsk, "You Must Remember This: A Test of the On-line Model of Voting," *The Journal of Politics,* vol. 63, no. 1, 2001, pp. 29-58.

[20] L. Huddy and A. H. Gunnthorsdottir, "The Persuasive Effects of Emotive Visual Imagery: Superficial Manipulation or the Product of Passionate Reason?" *Political Psychology,* vol. 21, no. 4, 2000, pp. 745-778.

[21] L. L. Kaid, "Effects of Political Information in the 2000 Presidential Campaign: Comparing Traditional Television and Internet Exposure," *American Behavioral Scientist,* vol. 46, no. 5, 2003, pp. 677-691.

[22] J. W. Payne, J. R. Bettman, and E. J. Johnson, "Adaptive Strategy Selection in Decision Making," *Journal of Experimental Psychology: Learning, Memory, and Cognition,* vol. 14, no. 3, 1988, pp. 534-552.

[23] B. K. Kaye and T. J. Johnston, "Online and In the Know: Uses and Gratifications of the Web for Political Information," *Journal of Broadcasting & Electronic Media,* vol. 46, no. 1, 2002, pp. 54-71.

[24] S. Robertson, "Voter-centered Design: Toward a Voter Decision Support System," *ACM Transactions on Computer-Human Interaction,* vol. 12, no. 2, 2005, pp. 263-292.

[25] S. Robertson, P. Achananuparp, J. Goldman, S. J. Park, N. Zhou, and M. Clare, "Voting and Political Information Gathering on Paper and Online," *Extended Abstracts of CHI '05: Human Factors in Computing Systems,* New York: ACM Press, 2005, pp. 1753-1756.

[26] S. Robertson, C. E. Wania, and S. J. Park, "An Observational Study of Voters on the Internet," *Proceedings of the 40th Annual Hawaii International Conference on System Sciences (HICSS '07),* IEEE Press, 2007, p90c.

[27] M. Lodge, K. McGraw, and P. Stroh, "An Impression-Driven Model of Candidate Evaluation," *The American Political Science Review,* vol. 83, no. 2, 1989, pp. 399-419.

[28] M. Lodge, M. Steenbergen, and S. Brau, "The Responsive Voter: Campaign Information and the Dynamics of Candidate Evaluation," *The American Political Science Review,* vol. 89, no. 2, 1995, pp. 309-326.

[29] J. W. Payne, "Task Complexity and Contingent Processing in Decision Making: An Information Search and Protocol Analysis," *Organizational Behaior & Human Performance,* vol. 16, no. 2, 1976, pp. 366-387.

[30] J. Landis and G. Koch, "The Measurement of Observer Agreement for Categorical Data," *Biometrics,* vol. 33, no. 1, 1977, pp. 159-174.