Do logos and brand labels impact peoples' selection behaviour in web search

Stephan Schlögl
Trinity College, University of Dublin
School of Computer Science and Statistics
O'Reilly Institute, Dublin 2
+353-(0)-1-896-1718
schlogls@cs.tcd.ie

Duncan Brumby
University College London
UCL Interaction Center
Malet Place, London WC1E 6BT
+44-(0)-20-7679-0689
Brumby@cs.ucl.ac.uk

ABSTRACT
Internet search engines provide an invaluable tool for finding information on the Web. Recent plug-ins can automatically supplement the textual snippet of each search result item with a visual logo. A study is presented that evaluates whether this text+logo interface allows users to find task-relevant information quicker than when they use a standard text-only interface. Twenty participants completed 30 search tasks using both types of interface. The position at which result items appeared on the page was manipulated so that items were not always presented in the standard relevance rank ordering. Results show that there was no benefit to users using the text+logo interface compared to the standard text-only interface. This might be because for a logo to be effective it must first be recognized by the user. Consistent with previous research the results show that users have a strong bias for selecting items that appear towards the top of a search engine's result page, regardless of their actual relevance.

General Terms
Design, Ergonomics, Human Factors.

Keywords
Visual search, World Wide Web, Logos, Icons.

1. INTRODUCTION
Using an Internet Search engine, such as *Google* (http://www.google.com) or *MSN* (http://www.msn.com), has made it almost effortless for us to look for things on the web. All one has to do is type in a query to the search field and click the 'search' button. What is returned is a list of the top 10 most relevant websites for the query. To determine whether any of these items should be clicked on, the user can read the title of the page or a summary snippet, or inspect the URL of the target site. All of this information is textual - hence the user has to invest time reading each link to evaluate whether or not it matches their goal [3][6][9]. Recently though icons have been brought to the result page. A Firefox plug-in for instance automatically supplements the textual information on a search engine's result page with visual logos for each item. The idea here is that users will be able to evaluate logos faster than reading the textual information – and so find what they are looking for faster.

While some logos will 'pop-out' to the user who has a clear idea of the site that they want to navigate to, many users will have a fuzzy idea of what they are looking for. Cutrell and Guan [6] have shown that users adopt different search strategies when using a search engine to navigate to a particular site compared to when they are using the search engine to find out about a general topic. In particular, Cutrell and Guan found that users were more likely to look at the URL information given for a search result when they were engaged in a navigational search. We might expect users to make similar use of logo information when performing navigational searches. There might be little benefit to presenting logos when users are engaged in more open-ended informational searches though.

For a logo to be useful in guiding navigational searches it must of course be recognized by the user. Some logos will pop-out at the user. For example, a user looking for the website of the McDonalds fast food franchise will likely recognize instantly the Golden Arches logo. There are of course very few logos that have such global recognition. It might also be the case that incorporating logos on a search engine's result page is only beneficial if the user is familiar with the logo.

In the paper, we describe the results of an empirical study that was designed to evaluate the effectiveness of including icons on a search engine's result page. Based on literature that shows that people can process iconic information easier than text [8], we predicted that users would be faster at finding a suitable website when there were icons. Also, in order to account for the "Google" bias of clicking the top item, the rank order in which result items were displayed was varied.

2. RELATED WORK
Several researchers have already been exploring the human search behaviour. Results led to rather accurate cognitive models explaining and simulating the search process [11][4] [16]. Based on those, further studies were looking at the influence hierarchy [12], ordering [13], color [5][10] as well as the grouping [2][7] of elements has on search performance. Finally Pirolli and Fu [15] were interested in the time a user would spend searching for information and therefore developed a prediction model of when people would leave a website.

3. BACKGROUND
Adding to this pool of knowledge on web search the work reported in this paper focuses on logos and brand labels and whether their usage, as a means of augmenting result items, changes the way people interact with the search engine.

Looking at a common search engine result page, items are listed, including a short text description (snippet) of their content, based on their relevance to the entered search query. This relevance is defined by the page rank, an ordering mechanism whose exact formula is a rather protected secret of search engine companies, yet it is generally based on the number of times a website is linked to. Earlier studies showed that, in order to make a selection, people tend to choose among the first ranked items [6]. It is unclear, however, whether specific pictorial information added to result items

would change this selection behaviour. Therefore, by adding relevant logos to result items it is sought to give people an additional channel of information so they would get a clearer picture of what they could expect. Some researchers were already interested in how pictorial information changes search strategies [8] [17]. Until now, however, little was done on logos and brand labels and their specific attributes in connection to web search. Based on the fact that pictorial brand representation generally supports recognition it is assumed that logos would have a high potential when it comes to helping people choosing the one item from a result set, which most likely satisfies their information need. More concrete, it is supposed that if people search for a specific target, logos will allow them to evaluate a search result page faster. On the first glimpse they would see if the desired item is among the results without even reading any text.

4. EXPERIMENT

In order to explore the effect of pictorial representatives on search behaviour a lab-based search experiment measuring several factors was conducted. In particular it looked at selection time, re-query rate as well as the actual result item people choose on a first result page. Do these factors change if a logo is presented next to each result item? And if yes, can this be used as a means of improving Internet search; maybe increasing its overall efficiency?

4.1 Method

A controlled search experiment was conducted in which participants completed 30 search tasks. They were asked to use Google (http://www.google.co.uk) as a search engine. In the experiment half of the search results were displayed in a "standard" Google result representation and the other half were enhanced by logos using the Google icon v1.5 plug-in (https://addons.mozilla.org/en-US/firefox/addon/4676) for the Firefox web browser (http://www.mozilla.com/en-US/firefox/). In other words, people were on the one hand using a standard representation that confronted them with a plain page offering an input box for search queries and a button to start the search process. Results in this representation listed the title, its URL as well as a small part of the website's content (snippet) for any result. On any page exactly 10 results were displayed. As a second mode they used the enhanced representations for which a logo was added next to the standard information for every result item.

In addition to the actual search task, people were also asked to complete a questionnaire investigating their familiarity with different logos and collecting some demographic data.

4.2 Participants

A total of 20 participants took part in the experiment. Nineteen of them were postgraduate students from different programs at University College London (UCL); mainly from the psychology department. One participant was a postdoctoral researcher at UCL. The project leader directly contacted the participants and there was no payment involved.

Participants were all experienced Internet users working with it on average 27 hours a week and rating their own competence of using it from excellent (50% of the participants) to good (50% of the participants). In terms of age, 70% (14 participants) of them were between 20 and 30 years and 5 participants were between 31 and 40 years old. Only one person was above 40 years old. Nine of them were male and all had normal or corrected normal vision.

4.3 Design

The goal of the experiment was to explore the effect of logo-enhanced search results on human search behaviour. Therefore a 2 (result representation) x 2 (task type) x 3 (target position) within-subjects design was used. That is, participants needed to solve a total of 30 search tasks, half of them using a normal Google search engine representation, the other half using the same Google search engine representation but enhanced by logos. Half of the tasks were of navigational the other half of informational task character (cf. [1]). All tasks could be solved by selecting a valid target object placed somewhere among the items on the first result page. The target was positioned either within the first three results (position: top), between result four and six (position: middle) which is still above the fold of the screen, or between result seven and nine (position: bottom) for which participants would need to scroll in order to see it. There was no target object positioned on the 10th (last) rank of the result page.

The tasks and their order were the same for all participants. Counterbalancing was only required in order to control any effect of variability between particular search questions across result representation (logo/no logo) and result position (top/middle/bottom). In order to do so, participants were assigned to six different groups.

The main depended variable for the experiment was the actual time it took participants to select an object from the first page or start a re-query, respectively. In addition it was looked at the error rate that was described by the deviation of a chosen object from the intended target object. Eye tracking data was collected in order to further investigate any discrepancies within the performance data.

4.4 Material

30 search tasks were defined. Based on Broder's [1] search taxonomies tasks were split into navigational and informational tasks. Navigational tasks were aimed at finding a specific website (e.g. *Find the official website of Angela Merkel, the female chancellor of Germany*), whereas informational search tasks required the participant to locate a specific piece of information (e.g. *Find out who won the Oscar for the best main actor in 2000*). All of them were defined by the experimenter but derived from comparable tasks used in earlier experiments (cf. [6]).

4.4.1 Setup

The tasks were presented on the screen using a *Firefox* (v2.0.0.4) web browser. A link next to each search task showing the terms of a start query opened a new browser tab with an initial predefined result page. The terms for this initial query were defined by the experimenter. No pre-experimental rating of query terms was conducted.

Participants were using Google as a search engine, yet the first result page for any task was predefined. That is, as a start they were presented with a manipulated result page containing ten search results chosen from the first five result pages of an original search query.

The search behaviour was observed by looking at this very first page whose layout was based on a "normal" Google result screen. Sponsored links as well as any special formatted items like video content on this first result page were removed. By doing so the page always contained ten standard formatted Google result items – one target item and nine distracters. The experimenter defined the intended target item and its position (top/middle/bottom) was varied and counterbalances across the different participants. Even though

the page was manipulated, it was fully functional as to give participants the feeling of a natural search experience. People were able to re-query or select other result pages at any time. None of the participants mentioned that he/she would have noticed any difference between the first page of a search task and the following.

In order to collect click and eye movement as well as performance data a *Tobii* 1750 19" eye tracking screen was used. In addition a key-logging tool was backing up and verifying the collected data.

4.4.2 Appearance

Half of the search tasks were using the "standard" Google layout, the other half added a logo next to every result item. As a logo the *favicon* of a website, which is generally located in the root directory (*favicon.ico*), was used. For the predefined first result pages this icon was locally stored in order to avoid load time latencies. Since it was important to provide those logos throughout the whole search task the Firefox web browser was extended by the Google icon v1.5 plug-in (https://addons.mozilla.org/en-US/firefox/addon/4676), which dynamically reads out the root directory of a result item and puts the logo, if it is found, next to it. If no such *favicon.ico* file was found only the result item itself was displayed. Therefore we were sure that no error messages would appear that could have deflected the participants' attention. As well as in the typical Google form of representation described earlier, also in the logo-based result representation no participant noticed any differences between the first predefined page and the ongoing ones.

4.4.3 Questionnaire

In addition to the experiment a short questionnaire was devised in order to assess familiarity with brand logos. This was important because only familiar items were supposed to have an effect on search behaviour (cf. [8]). Participants were asked to rate their familiarity with logos on a four point likert scale (*1- I am familiar with the logo; 2- I am likely familiar with the logo; 3- I am likely not familiar with the logo; 4- I am not familiar with the logo*). Sixty out of the 229 distinct logos, which later were presented on the different predefined result pages during the experiment, were chosen randomly. They were put together into three blocks. The order of these blocks was varied among the participants so as to control for any effects that ordering might have on the rating of a logo. The questionnaire was paper-based and furthermore comprised demographic questions as well as questions dealing with the participants' competence in using the Internet.

4.5 Procedure

The experiment was conducted under lab conditions. Participants were assigned randomly to one of six different groups (A1 to A3 and B1 to B3). They started their session by completing the questionnaire. Afterwards the eye-tracking screen was calibrated and the participants were shown the first page of the experiment, which gave a short introduction to its course. If there were no further questions they were asked to start the experiment by clicking on the start link bringing them to a page containing the first 15 tasks to be solved. For every task they were asked to search for a specific bit of information or a distinct website (e.g. *You are a fan of different TV shows. Find out when the next Episode of Heroes will be on BBC*). In order to start their search a link compromising a first search query was displayed next to each task (e.g. *Heroes BBC*). When clicked a new browser tab displaying the first (predefined) result page was opened. Participants were asked to use this browser tab during their search and close it after they successfully accomplished a task or when the experimenter told them to do so. The second tab holding the question page was accessible throughout the whole experiment.

Even though the first result page was manipulated, it was fully functional. People were able to choose another result page by clicking on corresponding links or alter the query term and start a re-query at any time. In order to keep the whole experiment within a certain timescale a limit of maximum two minutes for each task was defined. Hence, the experiment took a maximum of sixty minutes (2 minutes x 30 tasks) for each participant to complete.

After finishing a task, even if a solution was not found within the time frame of two minutes, participants were asked to close the search-tab and write *ok* in a text field provided above every task in the task-tab. This was used as an additional way of separating the different trials when looking at the log files of the key logging software.

After they had completed the first 15 search tasks, participants were given a short break, which also gave the experimenter the possibility to change the representation mode from textual to logo-enriched search results or vice versa. Participants from group A (A1, A2, and A3) worked on the first 15 tasks using the normal Google style of representation. After the break they then switched to the logo-enriched representation mode to solve the remaining tasks. For participants from group B (B1, B2, and B3) the scenario was reversed. Hence, as the order of the tasks was not changed, participants from group B solved the first 15 tasks using the logo-enriched representation whereas participants from group A did so with task 16 to 30.

All participants completed the 30 tasks even tough the correct target item was not always found. However, most participants found the right answer even by choosing different result items. In order to increase the validity of future experiments an alternation of some of the tasks is therefore recommended.

5. RESULTS

The previous section explained the experiment used to explore the effect of logos and brand labels on human search behaviour during web search. It was described how a website's favicon was used to present a pictorial representation of any result item next to its textual description. The 30 search tasks participants had to accomplish were discussed and it was explained how they were counterbalanced as to search for any representational as well as positional effects.

This section now highlights the results of the experiment. It shows whether a logo-enriched representation of search results had a significant effect on the time it took participants to select an item or start a re-query attempt. It furthermore discusses the influences logos had on participants' error and re-query rates as well as on which item they chose. In addition to the representation mode (no logo/logo), positioning effects were explored. That is, it was observed whether a logo effect is depending on the position of the intended target item or if it is consistent on all areas of the screen. For analysis the data that was recorded by the data-logging software during the experiment as well as some of the eye-tracking data collected through the *Tobii* eye-tracker was used. In addition to general descriptive statistics 2 (task type) x 2 (representation mode) x 3 (target position) repeated-measures ANOVAs were applied to find any significant effects ($p < 0.05$) between different groups.

5.1 General data

All 20 participants successfully completed all 30 tasks even tough a correct solution was not always found. Hence, a total of 600 search trials (30 tasks x 20 people) were available for analysis. The overall re-query rate was 28% and the error rate 39%. Consequently, in 33% of the trials people chose the intended target object on the first result page. It took participants on average 36 minutes to complete the whole experiment, whereas the solving time for a single task lay between 5.5 seconds and just over seven minutes. The selection time for an item on the first result page was between 192 ms and 64 seconds.

5.2 Search performance

First the mean selection time was analyzed. Twenty-four trials out of the 600 were removed because selection time for the first item was greater than two standard deviations of the sample mean (threshold: 21.6 seconds). Focusing on the remaining 576 trials, it took people on average 6.6 seconds (S.D. = 4,593 ms) to choose an item from the first result page or start a re-query attempt, respectively. On a text-based result page it took participants on average 6.5 seconds to select an item (S.D. = 4,492 ms), on a logo-enriched result page it took them 6.7 seconds (S.D. = 4,699). A repeated-measures ANOVA showed no significant difference in selection time between the two groups; $F(1,19) = 0.144$, $p = 0.708$. That is, people did not choose an item faster if logos were added to the search results. Hence, any hypotheses stating a performance growth for logo-enriched search results needed to be declined.

Apart from the type of representation, the different areas in which the intended target object was positioned and their selection times were compared. The results show that it took participants on average 6.3 seconds (S.D. = 2,325 ms) to select an item from the top, 6.5 seconds (S.D. = 2,946 ms) to select one from the middle and 7.0 seconds (S.D. = 3,279 ms) to select an item from the bottom of the page. Again a repeated-measures ANOVA did not show any significant differences between the groups; $F(2,38) = 1.317$, $p = 0.280$. More concrete, participants did not vary their selection time based on the position of the intended target item. In fact, it seemed that they stuck to a search strategy in which objects towards the top of the page were selected more often than those towards the middle or end of the page; an effect which seems quite typical for Internet-based search tasks.

Finally, focusing on the task type (navigational/informational) again no differences in selection time were found. It took people on average 6.4 seconds (S.D. = 4,479 ms) to select an item when working on a navigational, and 6.7 seconds (S.D. = 4,702 ms) when working on an information search task. A repeated-measures ANOVA found no differences between the groups; $F(1,19) = 0.676$, $p = 0.421$. That is, people did not speed up their selection process when the search task was of navigational character. Thus, it can be inferred that logos did not influence the search performance for a specific type of search task.

In summary, one can say that the experiment could not reveal any representational factors that would significantly influence selection time. Therefore all hypotheses, which predicted an increase in search performance, needed to be declined.

5.3 Error rate

Next it was looked at the error rate and how it might be influenced by the presence of logos. Every time a participant either re-queried or chose an item from the first result page different to the intended target item it was counted as an error trial. By doing so the total error rate for the experiment was 67% (28% re-query rate + 39% error rate). Looking at this rate in more detail a repeated-measures ANOVA found no difference in the amount of errors based on the form of result representation; $F(1,19) = 2.656$, $p = 0.120$. That is, adding logos did not significantly raise the possibility of choosing the right target object. However, there seemed to be a trend towards a smaller error rate when logos were present (71% error rate without logos compared to 64% error rate with logos).

On the other hand, when focusing on the target area, significant differences between target objects positioned towards the top, middle or bottom of the result page, could be revealed (cf. Figure 1). In detail, participants were more likely to select a target item when it was positioned towards the top of the page (42%) than when it was towards the bottom of the page (24%).

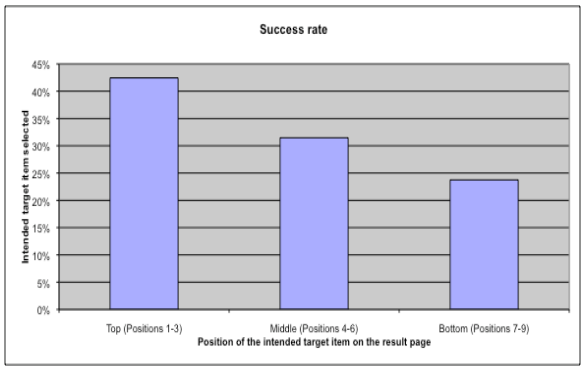

Figure 1. Success rate based on the position of the target

A repeated-measure ANOVA did not reveal any difference between the top area (items 1 to 3) and the middle area (items 4 to 6). Also the likelihood of choosing an item in the middle area and the bottom area (items 7 to 9) seem to be similar. Between items positioned in the top area and those positioned in the bottom area, however, a highly significant difference - $F(2,38) = 6.76$, $p = 0.003$ – was shown. This supports the theory that people chose only among the top items on a result page and did not look any further down, even though there might have been a more suitable result to choose. Consequently the likelihood for a target item to be chosen was higher when it was among the first items on the result page than when it was towards the end of it.

5.4 Chosen item

In order to draw a clearer picture of which items people preferably chose on a result page, further analysis were conducted. On average participants chose the 2.59th object on the screen. That is, people chose among the first two or three objects. Even though there was no significant difference between text based (2.26th) and logo enhanced (2.93th) result pages, $F(1,19) = 0.113$, $p = 0.740$, a small trend of people considering more items when they perceived logos seems to be present. Looking on the median however, it was shown that they on average chose their item from position one or two no matter what form of representation was used. Therefore position one and two account for more than 60% of the first clicks throughout the whole experiment.

Another result, which supports the fact that participants did not change their selection behaviour when the representation mode was changed, is based on the actual ranking order of the chosen item positions. It shows that if one looks at the first chosen item positions the outcome is the same no matter

whether there are logos present or not (cf. Figure 2). More concrete, in both notations the most chosen item was on position one, the second most chosen item was on position two and so on.

The result was stable among all the tasks since a further analysis focusing on the task type showed no difference between informational and navigational tasks. Hence, it seems salient that logos really did not change peoples' first selection as they even chose the same items in both notations.

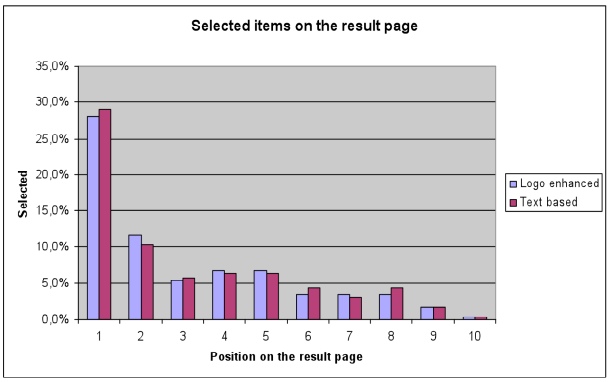

Figure 2. Selected items based on their position

Looking on the actual chosen item, an exceedingly high number of first clicks on a result item, which led participants to a sub-site of Wikipedia (http//www.wikipedia.org), was discovered. On average every fourth first click (25%) was directed towards the well known online encyclopaedia.

Another analysis was focusing on the distinct result page and whether the position of the target object influences peoples' selection on it. The results show that the amount of items from which people chose indeed depends on the position of the target item, $F(2,46) = 15.242$, $p = 0.000$. That is, people were more likely to choose among the first two items of the page if the intended target item was positioned within the top area ($M = 2$), whereas if it was positioned in the middle or bottom area, they tended to enlarge their selection and further considered item three and four ($M = 3.5$). Thus, as the intended target item can be seen as highly relevant in terms of meeting a search request, it can be inferred that even if people generally tend to choose just from the first two items of a result page, their selection range increases if the quality of those first results is not good enough. Yet it increases only by one or two items.

5.5 Re-query rate

Apart from the actual error rate, also the re-query rate and how it was influenced by the different factors of the experiment, was investigated. Again a repeated-measurement ANOVA was used to explore the differences in peoples' re-query behaviour when the representation type was changed (no logo/logo) or the target position varied (top/middle/bottom). For both dimensions no significant effects could be found. However, the results show some interesting trends. First the re-query rate tends to be smaller when logos are present (25%) than when they are not (31%); $F(1,19) = 3.077$, $p = 0.093$. That is, people found a suitable object more easily when additional pictorial representations of the result items were given. This also correlates with quotations of several participants who experienced the existence of a logo next to a search result as a valuable attribute helping them to make their selection.

Second, looking at the position of the target object, it was shown that participants re-queried less often when the actual target item was within the first result items (22%) compared to when it was positioned towards the middle (31%) or end of the page (31%). A repeated-measures ANOVA showed a trend ($p < 0.1$) supporting this effect. It seems that people preferable only looked at the first result items and let the perceived quality of those steer their further actions.

5.6 Eye tracking

In order to verify the results stating that people more likely looked at items positioned at the top of the page than at those positioned towards the middle or end independently of the representation type, a further analysis of the actual eye tracking data was conducted. By doing so the focus lay on those areas of the screen where people consciously were looking at. Thus the fixation data recorded by the eye-tracker was used. One fixation was defined as looking at an area of the screen for at least 100ms. This is the minimum amount of time people spent looking at something in order to process its content.

The result of the analysis completely supports the preceding outcomes. It shows that people barely scrolled down in order to look at items beyond the fold of the screen. More precise, on average a participant fixated 4,852 areas throughout the whole experiment, yet only 20 (0.42%) of them where reached through scrolling. A quarter of all the fixations were observing only the top of the screen (0 to 290 pixels) in which the address line of the browser and the Google search field were situated. This is reasonable as in this area people mainly entered text, which is consequently accompanied by a high amount of fixations. Interesting is, however, that the median of all the fixations was at 434 pixels from the top. Having a screen resolution of 1280x1024 pixels this means that 50% of the time people were actively looking at areas that barely included the top of the second result item. Hence, the fixation data completely aligns with the previous results stating peoples' preference for the first two result items. Only if they were unsatisfied with the first two results they further looked at result three and four. Therefore 75% of all the fixations lay between the top of the screen and result number four.

In general it can be said that the eye tracking data supports the prime outcome of the whole experiment, which is that people were highly influenced by the order in which results appear on the screen and therefore only observed the top areas before they altered their search term. A modified type of result representation for which additional logos were presented next to each result item did not change this behaviour.

6. DISCUSSION

The previous section reported the results of an experiment exploring the effect of logos and brand labels on web search. It was highlighted that adding logos to search results did not speed up peoples' selection time. There was also no effect on the selection time when the position of the intended target item was varied between the top (position 1-3), middle (position 4-6) or bottom (position 7-9) area of the screen. It was shown that people tended to choose only form the top positions of a result page and that therefore the likelihood for a target item to be selected was higher if it was positioned among the first four result items. Finally a tendency of people starting a search query by visiting a sub-site of the online encyclopaedia Wikipedia (http://www.wikipedia.org) was salient.

This section now discusses these results and tries to find a valid explanation for their occurrence.

6.1 Search performance

The first hypothesis for the experiment was that people would select a target item faster if a pictorial representation in form of a logo or brand label is displayed next to each result item. This assumption was based on the fact that logos, just like the thumbnails used by Woodruff et al. [15], support fast recognition and people would use them to make their selection without reading the textual part (snipped) of a result item. The results, however, did not show any decrease in selection time when logos were displayed next to the result items. In fact, the average time for selecting an item on a logo-enriched result page was slightly higher than when no logos were present (M = 6,657 ms vs. M = 6,478 ms). One explanation for this could be that participants were not used to see logos next to the result items and therefore these pictorial representations rather distracted them than helped them making a selection. Such a distraction also aligns with Fleetwood and Byrnes [8] findings, which showed that unknown and complex icons lead to confusion and double-checking. Another reason might lie in the different search strategies to which people have already adapted (cf. [4]). Especially the tendency of choosing only among the first items of a result page seems predominant and hard to influence. Such a Google page-rank effect is also supported by the second result of the experiment. That is, varying the position of the actual target item did not influence participants' selection time. More concrete, it seems that during the experiment the relevance of a result item's content, no matter whether it was text-only or pictorial-enhanced, did not influence peoples' selection time. In fact, participants rather stuck to their predominant search strategy of choosing from the top of the result page or start a re-query. Of course, such behaviour could also be based on the actual perceived relevance of the defined target item as well as the quality of the displayed logos. After all, these parameters were defined by the experimenter and not validated by a pre-study.

6.2 Error rate

The overall error rate during the experiment was 67%. That is, for more than 2/3rd of the tasks participants either chose an item from the first result page which was different to what was defined as the intended target item, or altered the query term right away. Even though this error rate seems very high, it can be explained by the fact that participants were not told that any first result page would include a potential target item. In fact, it was tried to provide a natural search experience, in which people were allowed to act as they would in any other Internet search task. Therefore, a re-query rate of 28% as well as an error rate as high as 39% for the first chosen object seems quite reasonable.

Another explanation for the high error rate can again be seen in the relevance of the defined target items. As already mentioned earlier those targets were defined by the experimenter and not validated by any pre-studies.

Finally the experiment showed a smaller error rate when the target item was positioned towards the top of the result page. That is, participants chose the intended target item more often when it was among the first three items than when it was between the 7th and the 9th position on the screen. However, looking at other results that clearly show peoples' preferences of selecting items from the top of the screen (cf. [2]), a connection to the actual target item and its position seems unlikely. More concrete, the relevance of the target item seems to have no effect on the selection at all. Therefore, if it happens to be positioned toward the top of the screen its chances of getting selected are higher. This is less based on its relevance but rather on the fact that items from the top of the screen are selected more often.

6.3 Chosen item

As already mentioned the results of the experiment showed that people do preferable select result items positioned towards the top of the screen and that this behaviour does not change by altering the result presentation, neither does it by varying the position of the actual target object. For the position of the target item this can be explained by the fact that participants were not informed about the existence of such a distinct target on the first result page. Therefore its position did not influence their search behaviour. They just acted in the same way as they would have with any other Internet search task for which the most relevant items tend to be located towards the top of the page.

When it comes to logos not having an effect on what people chose, the already mentioned unfamiliarity with this form of representation might have had an impact. All of the participants were experienced Internet users and therefore already developed their own strategies of searching for information. Working with a different interface, however, demands a certain learning phase to go through in order to be beneficial. In fact, it seems that people did not have enough trust into the validity and significance of the logos and therefore stuck to their traditional way of selecting a result item by looking from the top to the bottom and from the left to the right (cf. [4]). Especially if logos appeared among the first result items for which they were not specifically familiar with, participants tended to become suspicious.

On the other hand, the used logos could have been too small to provide enough information on the actual content of a result item (cf. [14]). Several of the participants mentioned that they could not interpret what the logos represent. One even reported that she did not notice any logos at all throughout the whole experiment. She said that she primarily looked at the text summaries and URLs presented for each result item in order to make her selection; a behaviour that is quite common for experienced web users.

One result that was, however, impressive when it comes to the items selected by participants is the dominance of clicked links leading to the famous online encyclopaedia Wikipedia (http://www.wikipedia.org). It almost seemed that Wikipedia had an answer to any search task. People likely went there in order to start their search quest. This was further supported by some of the participants' quotations, which stated that Wikipedia is the easiest way of finding information. They also mentioned that if they could not find the actual information there, it would at least provide them with enough links to other resources they could have a look at. Thus, Wikipedia seems to be a quite strong factor influencing peoples' search behaviour; one researcher might have overlooked so far.

6.4 Re-query rate

Since previous results clearly show that people tend to select items rather from the top of the screen than from the middle or bottom (cf. [6]) it seems obvious that if such an item does not fit their expectations they likely try different search terms in order to obtain a better result set. A re-query rate of 28% as occurred in this experiment is therefore not outstanding for web search but rather normal. However, one reason for people altering the search request could have been the initially used search terms, which started every search task. Those terms were, just as the actual tasks and their assigned target items, defined by the experimenter. No pre-experimental rating of

terms was conducted wherefore their actual relevance was not tried and proven.

Furthermore participants were not told that a relevant target item was part of any first result page. Thus, they had no additional motivation to look at all results on the page and select the one best fitting the specific search task, but re-queried as soon as they thought the given result set would not meet their expectations. For the goal of the experiment, which was exploring peoples' search behaviour in web search, however, such a setting was necessary in order to provide a natural search experience.

Even though there was no observed parameter significantly influencing the re-query rate it was yet shown that when logos were present participants re-queried less (25% vs. 31%). Therefore it seems that logos did have some effect on peoples search behaviour. That is, if people only glimpsed at a result page pictorial representatives helped them to recognize the relevance of a result item more easily. Hence people found a target item that they would have overlooked if the logo were not present. Consequently this reduced the re-query rate.

A second trend, the experiment showed when it comes to participants altering the initial query terms, is that they did this less often when the target item was among the first results on the page. This again supports the theory of people only looking at the top area of the page and rather re-query than inspect the rest further down the screen. Furthermore it validates the relevance of the intended target item. More precise, they were more likely to find a suitable result item, namely the intended target item, within their preferred area, which let them re-query less often.

6.5 Navigational vs. informational tasks

Finally, based on Broder's [1] search taxonomies it was expected to find different effects for different types of tasks. That is, it was supposed that for navigational tasks, which aim for a specific website logos, would be advantageous and help people select a target item faster. For informational tasks, which aim for a specific bit of information rather than a website, a tendency of selecting knowledge based services like Wikipedia more often was expected. The results of the experiment, however, did not support those two assumptions.

Analyses of the two task types did not show any difference. Logos did not speed up peoples' selection process no matter whether tasks were of navigational or informational character. Even though a tendency for selecting knowledge-based services was salient, this was a general trend and did not differ between the two task types. The most likely explanation therefore might be that the border dividing navigational and informational tasks is rather thin. Often it is difficult to define whether a task is of navigational or informational character and therefore also hard to prove that a specific parameter influences one type of question more than the other one.

6.6 Implication for future experiments

Even though this experiment did not show that logos and brand labels would have significant effects on peoples' search behaviour, trends illustrating that they were supportive in some areas could be highlighted.

The biggest weakness of the experiment, however, was probably that there were no pre-studies conducted. In fact, three main parameters – the actual logos, the intended target items, and the initial query tasks – were defined by the experimenter without checking their actual relevance. In order to eliminate such possible inconsistencies in future experiments one should run independent rating studies on those factors. Doing so might lead to different results not only when it comes to manipulating the selection time but also when it comes to drawing a conclusion on participants' error and re-query rates. Finally it seems that slightly bigger logos and more time to get used to having them, as an additional source of information, might be beneficial for future experiments. By doing so, future studies might show that logos and brand labels do indeed have a significant positive impact on peoples' search behaviour.

7. CONCLUSION

The effect of logos and brand labels on human search behaviour in web search was explored. A standard Google result page representation was compared to a version in which those results were enhanced by the favicons of the result items presented. Based on the theory of icons being advantageous for recognition it was assumed that peoples' search behaviour would change and that they would select an intended target item faster. Furthermore, it was expected that people would choose items from the middle and bottom area of the result page more often when logos are present than when they are not.

The results of the experiment, however, showed that no such effects were significant. People spent approximately the same time selecting a target item on logo-enriched result pages as they did on standard text-based ones. Also the actual items they selected were independent of the result representation. That is, participants selected the same results in both notations.

The experiment, however, supported existing research result which state that people preferably choose items from the top of the screen and do not scroll down to make a selection. Hence they make fewer errors and do not re-query that often when a potential target item is positioned within the first three items of a result page.

Even though the initial hypotheses of the study stating a decrease in selection time for logo-enhanced search result pages were not supported by the experiment, a trend of logos being advantageous for a smaller re-query rate was shown. Also several quotations of participants saying that they liked the logos next to the result items as they helped them with their decision, supports the idea that there is place for this kind of result representation in future search engine designs.

So far it seems that people are just not used to have pictorial representatives next to search engine results and therefore rather check the textual description than blindly follow their first impression. Some smaller search engines, however, started to add logos and brand labels to their result items. Hence, in a future experiment people could have adapted to this new way of searching and therefore advantages for logo-enriched search results might become salient.

Finally, it must be said that, by asking for very specific bits of information and adding a time limit, the reported experiment explores only a very distinct search dimension. The influence of logos and brand labels in more explorative and exhaustive search tasks was not reviewed. Hereby, especially when brands are part of a given search tasks, additional pictorial information might very well change peoples' selection behaviour.

8. REFERENCES

[1] Broder, A. (2002). A taxonomy of web search. *SIGIR Forum, 36* (2), 3-10.

[2] Brumby, D. P., & Howes, A. (2004). Good enough but I'll just check: web-page search as attentional refocusing. *Proceedings of the 6th International Conference on Cognitive Modeling*, 46-51, Pittsburgh, PA: July 30-Aug 1.

[3] Brumby, D. P., & Howes, A. (2008). Strategies for guiding interactive search: An empirical investigation into the consequences of label relevance for assessment and selection. *Human-Computer Interaction, 23*, 1-46.

[4] Card, S. K. (1983). Visual search of computer command menus. In H. Bouma & D.G. Bouwhuis (Eds.), *Attention and Performance X: Control of Language Processes* (pp. 97- 108). London: Lawrence Erlbaum Associates.

[5] Carter, R. C. (1982). Visual search with color. *Journal of Experimental Psychology*, 8 (1), 127-136.

[6] Cutrell, E., & Guan, Z. (2007). What are you looking for? An eye-tracking study of information usage in Web search. *Proceedings of the CHI'07 Conference on Human Factors in Computing Systems*, 407-416, San Jose, CA: April 28-May 3.

[7] Dumais, S., Cutrell, E., & Chen, H. (2001). Optimizing search by showing results in context. *Proceedings of the CHI'01 Conference on Human Factors in Computing Systems*, 277-284, Seattle, WA: March 31-April 5.

[8] Fleetwood, M. D., & Byrne, M. D. (2002). Modeling icon search in ACT-R/PM. *Cognitive Systems Research*, 3 (1), 25

[9] Fu, W. T., & Pirolli, P (2007). SNIF-ACT: A cognitive model of user navigation on the world wide web. *Human-Computer Interaction, 22*, 355-412.

[10] Halverson, T., & Hornof, A. J. (2004). Strategy Shifts in Mixed Density Search. *Proceedings of the 26th Annual Meeting of the Cognitive Science Society*, 529-534, Chicago, IL: August 5-7.

[11] Hey, J. D. (1982). Search for rules for search. *Journal of Economic Behaviour and Organization, 3,* 65-81.

[12] Hornof, A. J., & Kieras D. E. (1997). Cognitive modeling reveals menu search is both random and systematic. *Proceedings of the CHI'97 Conference on Human Factors in Computing Systems*, 107-114, Atlanta, GA: March 22-27.

[13] Hornof, A. J., & Kieras D. E. (1999). Cognitive modeling demonstrates how people use anticipated location knowledge of menu items. *Proceedings of the CHI'99 Conference on Human Factors in Computing Systems*, 410-417, Pittsburgh, PA: May 15 – 20.

[14] Lindberg, T., & Näsänen, R. (2003). *The effect of icon spacing and size on the speed of icon processing in the human visual system. Displays, 24,* 111-120.

[15] Pirolli, P., & Fu, W. T. (2003). SNIF-ACT: A model of information foraging on the world wide web. *Lecture Notes in Computer Science: User Modeling 2003*, 2702, 146-156.

[16] Simon, H. A. (1990). Invariants of human behaviour. *Annual Review of Psychology, 41*, 1-20.

[17] Woodruff, A., Faulring, A., Rosenholtz, R., Morrison, J., & Pirolli, P. (2001). Using thumbnails to search the web. *Proceedings of the CHI'01 Conference on Human Factors in Computing Systems*, 198-205, Seattle, WA: March 31 – April 5.