National College of Ireland

How do you Google?

An eye-tracking study investigating users' search behaviour using Google search.

Conducted on behalf of
Mulley Communications

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1 Executive summary

This report presents the findings of an eye-tracking study which sought to analyse what users looked at when presented with the results page of 'Google search'; which is the most popular website in the world and in Ireland (Alexa topsites, 2009). The study then investigated if age, gender or prior experience had any impact on users' search behaviour.

This research was conducted by the National College of Ireland and testing took place in NCI's usability laboratory; the National E-learning Laboratory (NELL). A group of 27 users; ranging in age, gender and usage experience, participated in the study. Most users reported long-standing experience with using Google search. Users' behaviour was observed and analysed using Begaze eye-tracking technology. Analysis of data showed:

1. The first thing that 70% of users looked at in the results page was the first result presented.

2. However, users paid more attention relatively, to the highest ranking result rather than sponsored links at the top of the page.

3. Most users ignored the sponsored link on right-hand side of the results page.

4. The participants' main attention was focused on the top three results only.

5. The further down the result was presented on the page, the less likely the user was to look at it.

6. If users did look beyond the first three results, then it is likely they would explore the bottom of the page also.

7. If the "solution" was not included in the top two results, users were more likely to fail finding it.

8. Neither age nor prior interest had significant influence on search behaviour.

9. Generally, gender did not have a big impact on search behaviour, though females viewed results in more linear manner than males.

10. When asked to go to Bebo or YouTube, many users preferred using the Google Search engine to navigate to these websites rather than typing in the URL in the address bar.

These results broadly mirrored those found in previous US studies in the area, though we did see some differences in behaviour emerge, in terms of how much attention users gave to the highest ranking result and how gender influenced the way users viewed results.

2 Background

2.1 National College of Ireland

National College of Ireland is a third-level education provider committed to advancing knowledge in its specialist areas of business, human resource management, accountancy, finance, computing and community studies. Full and part-time courses in these areas are offered through the college's three Schools; the School of Business, the School of Computing and the School of Community Studies. Research at National College of Ireland is regarded as a core activity embedded in the academic culture and contributing to the overall mission of the college. For further details see www.ncirl.ie.

2.2 Centre for Research and Innovation in Learning and Teaching

Research activities are directed toward the following objectives:

- Study, develop, design and access new models, principles, practices, tools, artefacts and settings arising from the use of technology to support learning.

- Support and promote discourse on the application of e-Learning and blended learning within business, government and education sectors.

- Monitor, benchmark, review and report on national and international e-Learning policies and activities.

- Develop new models of teaching and training that support blended learning contexts.

- Apply flexible technology supported approaches to enhance skills in the workforce.

2.3 The National e-Learning Laboratory (NELL)

As part of National College of Ireland, the National e-Learning Laboratory (NELL) is a research facility specialising in usability testing for human computer interactions. NELL allows researchers to systematically explore and improve the use of learning and knowledge-based technologies. The laboratory consists of sophisticated hardware and software that can observe up to four participants simultaneously.

User behaviour and screen interactions are investigated using combinations of video and audio recording, screen-capture, precision keyboard & mouse logging and eye tracking.

NELL enables researchers to observe record and analyse the behaviour of students interacting with e-learning resources.

This data allows researchers to evaluate the students' learning experience in terms of the quality of engagement, learning gain, efficiency, effectiveness and usability.

2.4 Mulley Communications

This research was commissioned by Mulley Communications. Mulley Communications is a communications training and consultancy company who specialise in business blogging, online marketing training, media training and teaching companies about the latest online trends.

2.5 Previous studies on Google Search

Previous studies on web search behaviour in Google that used eye tracking technologies revealed several interesting results:

❖ Users explore only a fraction of the available results per page. On average, users view about three abstracts per results page (Lorigo et al, 2006).

❖ The top ranks of a results page are viewed more often and scrutinised in more details than ranks further down the page (Pan et al., 2007).

❖ The top two results received nearly equal attention, but the first result was much more likely to be clicked on (Lorigo et al., 2008).

❖ When browsing through the abstracts only 20% of users view them in the order they are presented on the page. Others may skip results or revisited previous results before continuing to explore further (Lorigo et al, 2006). This search behaviour seems to be influenced by gender: In one study, males were more likely to explore the results in a linear fashion, one-by-one in the order of appearance than female participants (Lorigo et al., 2008).

❖ The type of task had an impact on the time required to complete the task. So-called navigational tasks with single correct solution were completed much quicker than 'informational tasks' where several pages may contain the correct answer. However, the task type did not affect the search behaviour itself, such as the average rank selected or the linearity of the search (Lorigo et al, 2006).

All of these results are based on samples drawn from studies in the United States. The purpose of our current study was to investigate if we would get similar results from a study conducted in Ireland. Would participants with different cultural background show the same search behaviour? We were also interested in how users would react to the sponsored links that are presented on the right-hand side of the screen and sometimes on top of the page. We wanted to know if the sponsored links would influence search behaviour and if so, how?

3 Research Methods and Design

In order to answer these questions a user study was designed that would facilitate the observation of users of the Google search engine performing a number of pre-assigned tasks. Testing took place in NCI's atrium and analysis of data took place in NCI's e-Learning laboratory; NELL.

3.1 Eye-tracking

We used remote eye-tracking technology (RED4) to analyse the users' gaze behaviour. Two infra-red cameras located next to the computer screen scan the user's eye movements. After a short calibration phase the software can determine the exact gaze position. The gaze position can then be matched against content on the screen.

Eye-tracking is an interesting way of analysing search behaviour. It allows to measure and record what people actually look at rather than having to rely on think-aloud protocols or post-hoc interviews. Information like gaze duration, number of fixations and sequence of exploration is not easily available in any other way and can provide unique insights into what users are actually doing when looking at search results.

3.2 User Study Protocol

All participants followed the same procedure.

- Participants were asked to complete a short survey beforehand to obtain personal information such as age, gender, interests, use of computers etc.

- We then calibrated the eye-tracker for each subject, using a 9-point calibration and automatic validation procedure.

- Participants were given a set of short tasks, asking them to perform several Google searches (details below). Both, the tasks and the search result pages were presented to users on the screen.

- User behaviour was observed and recorded during observation using eye-tracker and interaction logging.

3.3 Tasks / Searches

Participants were asked to perform two types of searches, navigational and informational search tasks. Previous studies have shown that the type of task may influence search behaviour (Lorigo et al., 2006).

Navigational tasks are tasks where the user's intent is to find a particular webpage (Cutrell & Guan, 2007). For example, participants may be asked: "Find the homepage of Liverpool Football Club".

Informational tasks arise when the intent is to find information about a topic that may reside on one or more web pages. For example, participants may be told: "You are interested in finding a job, please enter search terms 'jobs and Ireland' and then chose link you consider most relevant".

Search terms were based on popular search items obtained from Google's data on Irish search queries 2008 (cf. www.google.com/press/zeitgeist) and participants were asked to carry out three informational tasks and three navigational tasks.

The test was designed in such a way that all users would land on the same search results screens. This meant that even if a user typed in a different search term, they were presented with the same results, i.e., the same page. This allowed us to cross compare results of all users and results screens.

Result pages were presented on a flat-screen monitor, using a resolution of 1200x1024 pixels.

The search results screen presented to users varied depending on the search they were asked to perform. Some of the results screens presented had "highlighted sponsored links" at the very top of the page (see Figure 2), while others did not (see Figure 1). All had sponsored links to the right of the page.

We were also interested in how users behave when asked to go to popular websites such as Bebo and YouTube. We were interested in observing how they found these sites, whether they entered terms in the Google Search box or typed the website URL directly into the address box at the top of the page. The last task required users to find these two websites.

Figure 1: Part of a results page presented for one of the navigational tasks ("Find the homepage of Liverpool Football Club"). The page included sponsored links on the right-hand side only.

Figure 2: Part of a results page presented for one of the informational tasks ("You are interested in booking a flight to Edinburgh. Search terms: 'flights Dublin Edinburgh'. From the search results, choose the link that is most relevant to you"). This page included sponsored links both on top ("highlighted sponsored links") and on the right-hand side.

3.4   Users

Observations took place over one day in the atrium of National College of Ireland (NCI). Participants were drawn from NCI student and faculty population and on the day of the test, thirty (30) participants were asked to take part in the study. Testers were chosen at random (whoever was in the College that day) and came from several different backgrounds ranging from computer science students to accounting lecturers and college faculty and staff.

3.5 Analysis

Two sets of results were collated and analysed, the on-line questionnaire and the eye-tracking data.

The on-line questionnaire was used to characterise the sample (age, experience, interests) as well as to split the sample into different subgroups as follows:

- Age: users were either aged from 17 to 21 or aged 22 years or above.

- Gender: users were either male or female.

- Prior Interest in the subject matter of the search task: in the pre-test questionnaire, users were asked to supply us with information on topics they were interested in, such as football, fashion, news etc. For each search, users were classified as having indicated a interest in this area or not.

The eye-tracking data was analysed using BeGaze 2 software (SMI). In order to analyse what participants were looking at, we broke each of the search results pages into separate 'Areas of interest (AOI)'. These were given a number ranging between 1 and 10 with 1 being the result at the top of the page, the highest rank. Sponsored links (either to right of results or top of page or both) were also defined as separate Areas of Interest (see Figure 3).
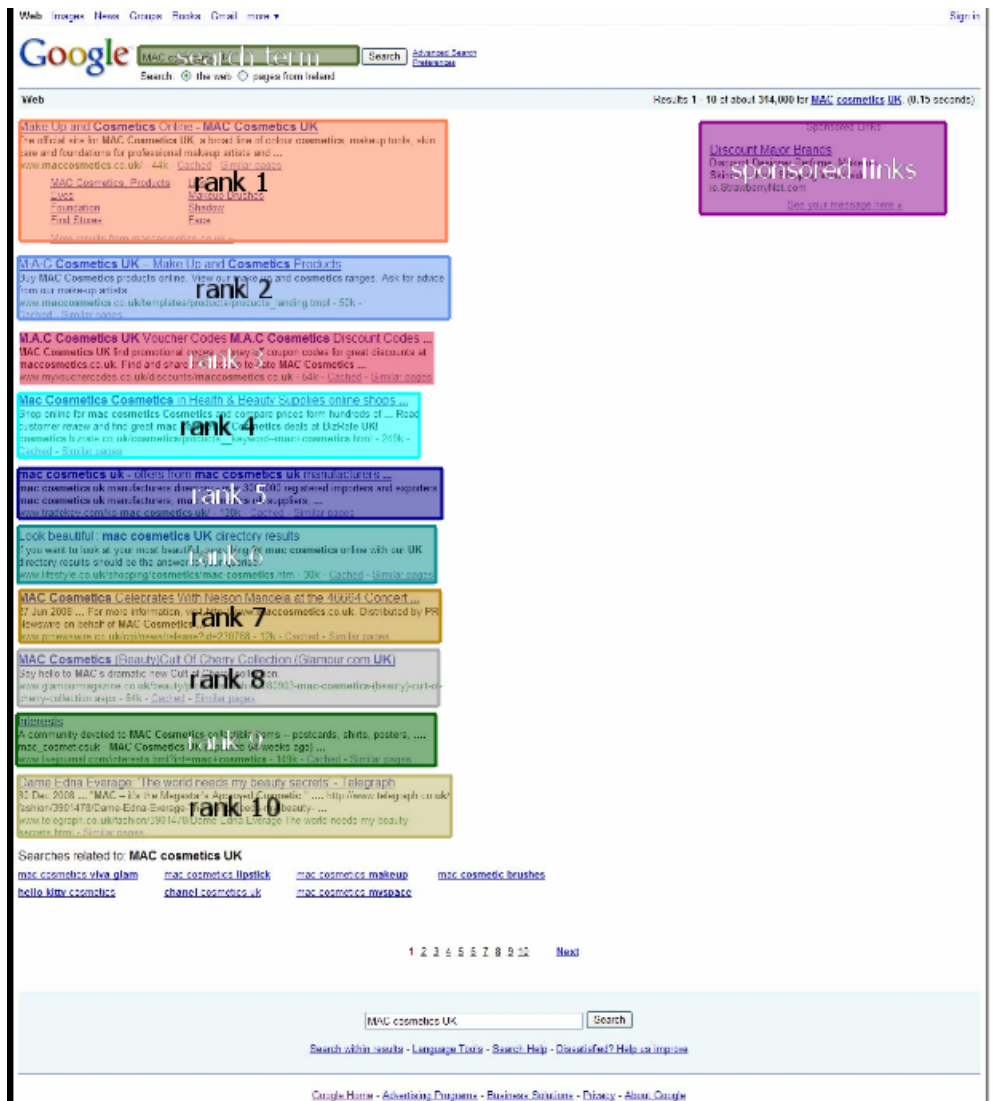
Figure 3: Areas of Interest on one of the search result pages

During analysis, the following measures were extracted for each participant per search:

- Total duration of search: the length of time (in milliseconds) from presenting the search results page until user selects search result

- Number of fixations per Area of Interest: The human eye does not smoothly gaze across the visual field but rather "jumps" from one point to the next. During these fixations, the eye is relatively stationary and virtually all visual input occurs during this time. The total number of times the user's eyes focused on a particular area of the screen can be measured.

This is usually interpreted as the degree of attention the user pays to this area (e.g., sponsored links or result rank 1).

- Glance duration per Area of Interest: based on the number of fixations it is also possible to measure the length of time (in milliseconds) the user's eyes were fixated on this particular area of the screen.

- Complete vs incomplete scan paths: The scan path is an interesting indicator of search behaviour as it describes the sequence of fixations on the screen for each task. We classified a scan path as "complete" if the search results were looked at in the order they occurred on the screen, i.e., rank 1 was viewed before rank 2 and rank 2 was viewed before rank 3. It was 'incomplete' if users skipped one or several results. We mapped the scan path against the Areas of Interest and analysed in which order the search results were viewed. This measure shows how sequential users' search behaviour was.

- Lowest (ranked) search result viewed: Users view various search results in different ways. One user may have looked at the top three results only, while others may have looked at results ranked 1 and 2 and then skipped down to view result ranked 6. For each search we analysed the lowest rank visited, i.e., the result furthest down the page. This measure indicates which result ranks have been considered and which have been ignored by the user.

We then analysed data against these measures and compared results across subgroups in terms of age, gender and prior interest.

4 Results

In this section we report on the major findings of this research. Firstly, we will describe the findings in search behaviours while using Google Search and secondly we will outline the variations in behaviours based on age, gender and prior interest in the subject matter of the search task. Finally, we then look at user search behaviour when participants were asked to navigate to Bebo and YouTube.

4.1 Sample

Of the 30 participants, we obtained complete eye-tracking data for 27 subjects only, as three of the subjects were unable to be calibrated. The remaining sample consisted of 16 male and 11 female participants.

Most participants reported long-standing experience with searching Google (see Figure 4). On a scale from 1 (novice) to 10 (expert) users claimed that they had reached an average of 7.07 (see Figure 5). This is close to the expertise reported in previous studies.

Experience with Google (years)
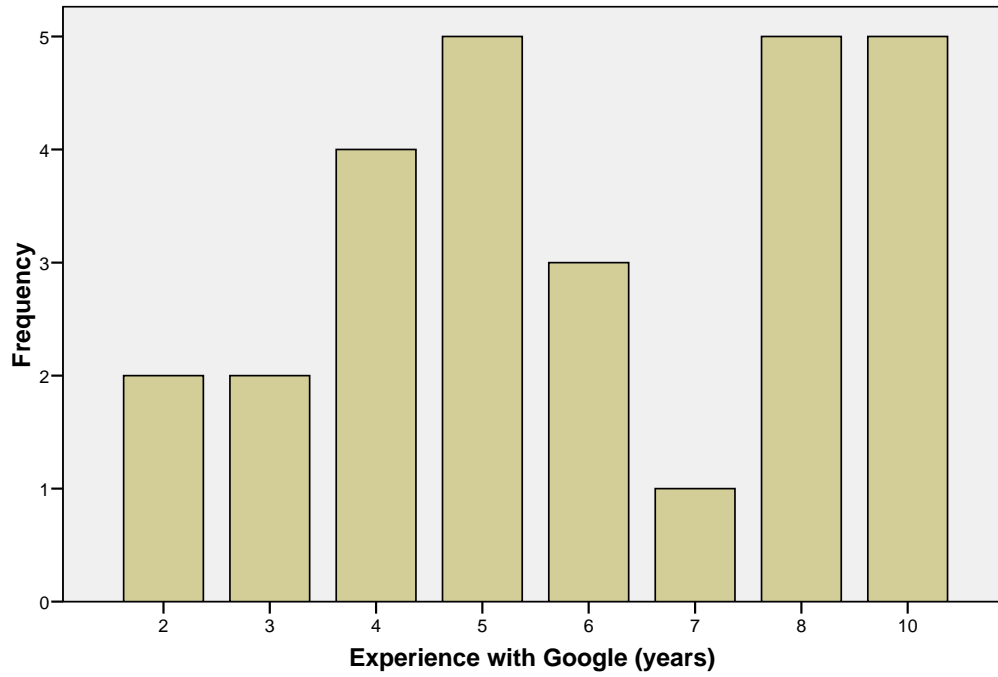
Figure 4: Experience with searching Google in years.   Frequency relates to the number of participants

How would you rate your expertise in search with Google?
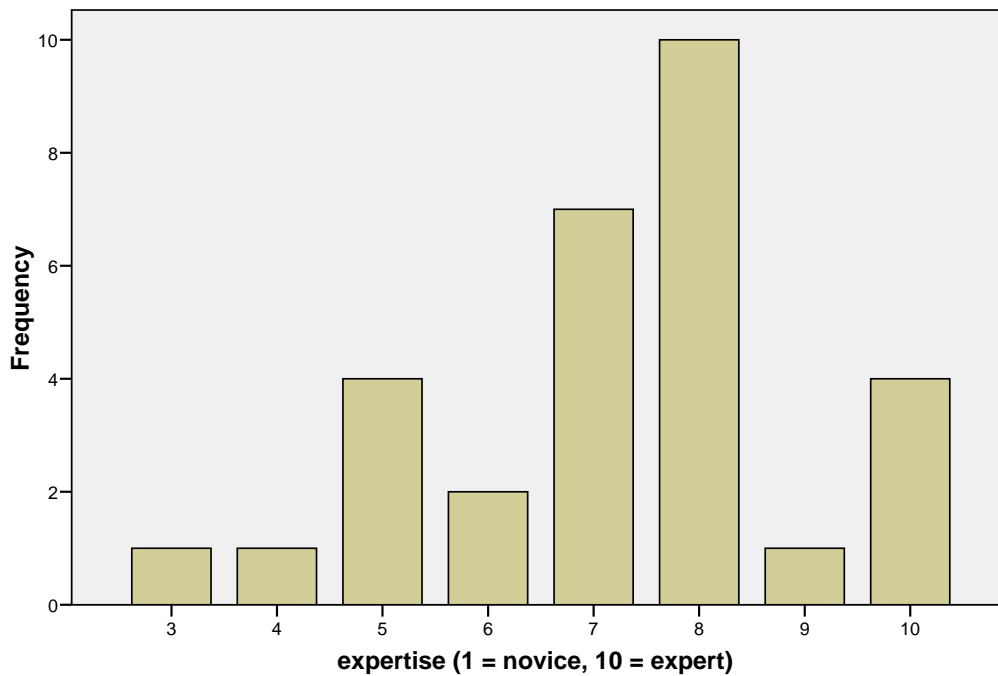
Figure 5: Expertise in searching with Google. Frequency relates to the number of participants

4.2 General Findings

In the following section we will discuss findings for all 27 subjects

The first thing that 70% of users looked at in the results page was the first result presented (whether it was a sponsored link or not).

There were a total of 569 fixations on the individual results on the Google Search results pages over all search tasks. 70% of users fixating on the first result on each search results screen, including highlighted links at the top screen on informational tasks. The heat maps for each search task show clearly that the main attention is on the top ranked results (see Appendix 3).

The second regular result (rank 2), received significantly less attention than the top result whether a sponsored link was present or not (t=3.18; p<.001). This result is not in line with previous studies which found that the top two results received nearly equal attention (Lorigo et al., 2008).

However, users paid more attention relatively, to highest ranking result rather than sponsored links at the top of the page

In terms of number of fixations and glance duration, although sponsored links at the top of the page, received almost as much attention as the highest ranking regular result, the highest ranking result still received more attention overall. This difference is statistically significant (t=2.34; p=.020).

Users ignored the sponsored link on right-hand side of the result page and users' main attention was focused on top three results only.

Participants ignored the sponsored links on the right-hand side of the results page. Results show that participants paid very little attention to these links, eye-tracking recording only 1.58% of all fixations.

To the contrary, as one might expect, the first ranking result was the result with the most fixations, 29% of all fixations. Together, the top three ranking results accounted for 55% of all user gaze fixations (see Table 1).

This shows that not surprisingly, only the most highly ranked search results (top 3 or 4>) are likely to be viewed by users.

These results are similar to findings in previous studies which reported that the top ranks of a results page are viewed more often and scrutinised in more detail then those ranked further down the page (Pan et al., 2007).

Table 1: Average glance duration and average number of fixations across all searches

Area of Interest	Glance Duration Average [ms]	Average Number of Fixations
rank 1	59.54	5.04
rank 2	29.28	2.63
rank 3	20.88	1.79
rank 4	15.13	1.20
rank 5	8.42	0.69
rank 6	5.27	0.48
rank 7	3.57	0.31
rank 8	3.34	0.30
rank 9	3.20	0.32
rank 10	3.01	0.28
rank 11	1.76	0.15
search term	0.53	0.04
sponsored links	2.48	0.23
highlighted sponsored links	49.90	3.73
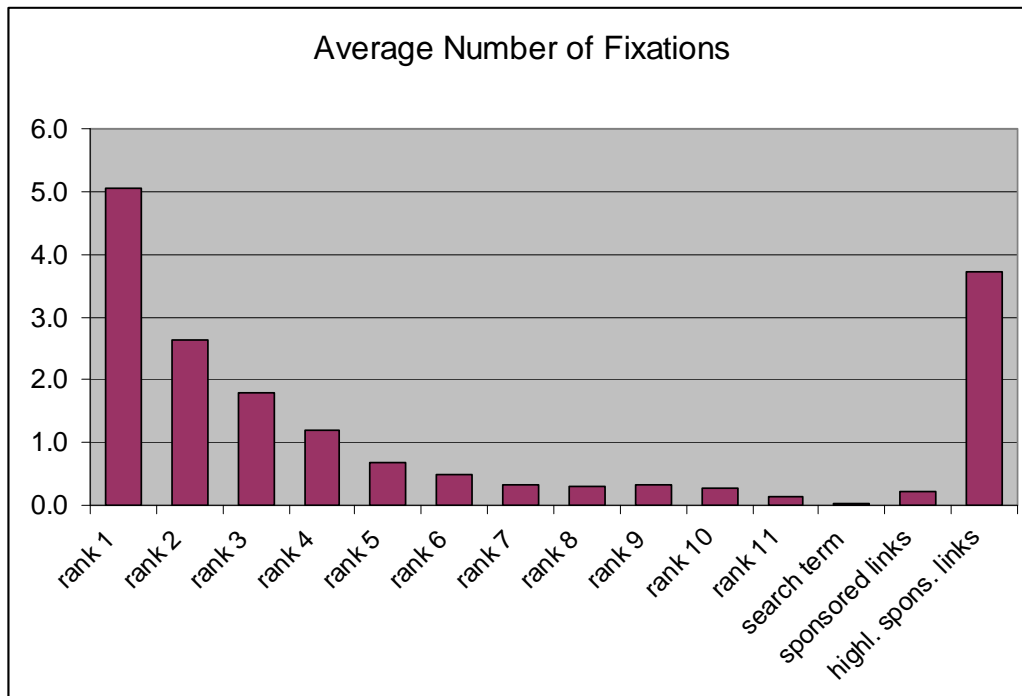
Figure 6: Average number of fixations across all searches
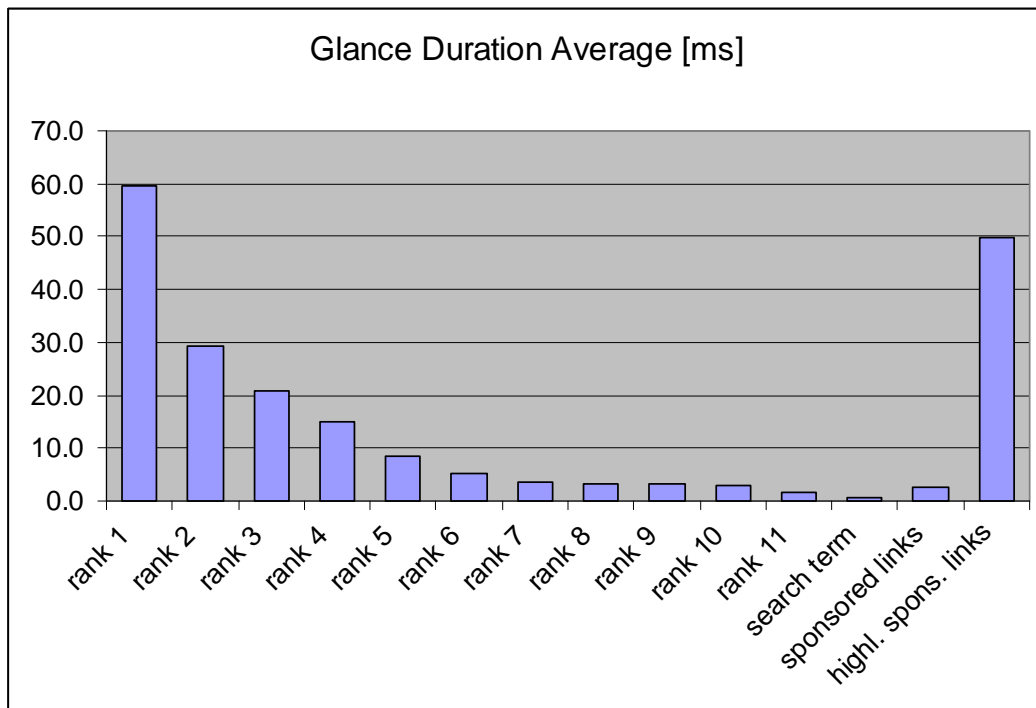
Figure 7: Average glance duration across all searches

The further down the result was presented on the page, the less likely the user was to look at it.

The number of fixations gave us an indication of what users were interested in looking at. Google search results are ranked in order of the appearance on the screen. In our study we found that, not surprisingly, the number of fixations dropped the lower the ranking of the search result, e.g., the further down the page the result was displayed, the less likely the user was to look at it. This was consistent across all tasks.

If users did look beyond the first three results, then it is likely they would explore the bottom of the page also.

Most people stop exploring after the fourth result. Many of those who did go beyond the top ranks, continue to the last result on the page (see Figure 8).

Interestingly, those users stopped exploring at results ranked 9 and 10 rather than 6 or 7 (see Figure 8). This could mean that participants viewed all results along the way or could be a result of users skipping forward to result number 10.

Lowest Search Rank Explored
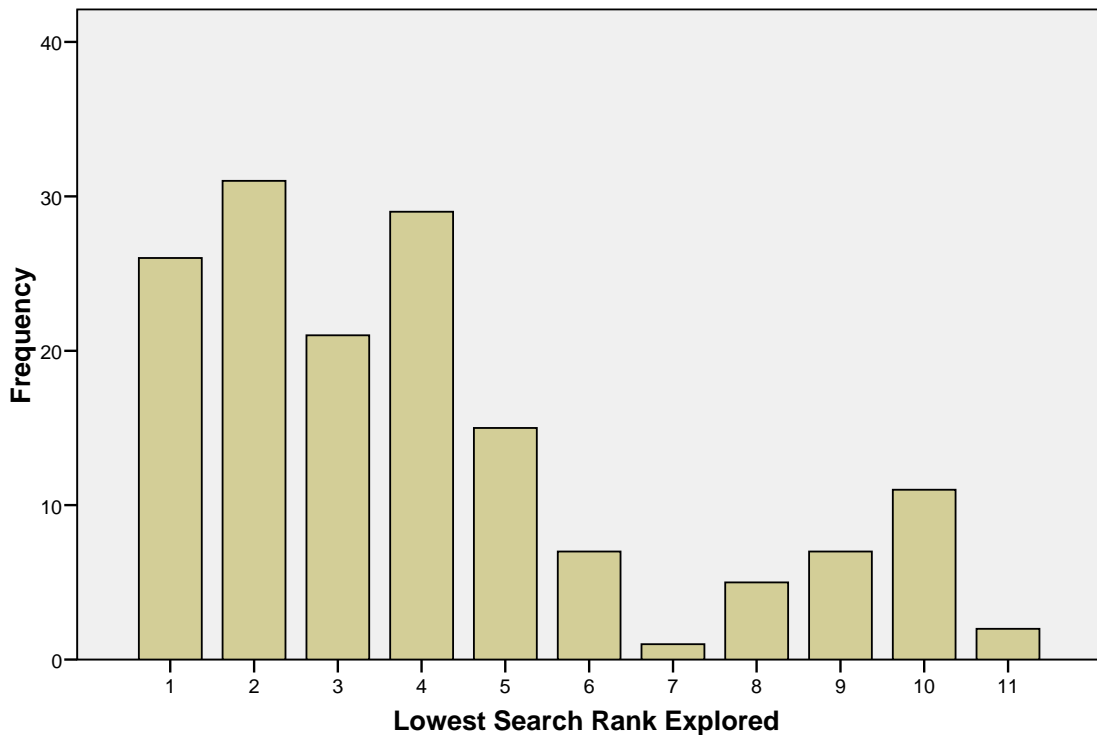
Figure 8: Summary of the Lowest Ranked Results visited by all users.

If the 'solution' is not included in the top two results, users are more likely to fail finding it.

Participants performed well on the navigational tasks; those tasks which one correct answer e.g. the homepage of Liverpool. In the majority of cases (87%) users selected the "correct" link on their first attempt. However, this success rate depends on where the link is located on the page. If the correct link is included in the top two results, 90% of users would find it immediately, while only 70% would find it if it is further down the page.

4.3 Influence of User Characteristics on Search Behaviour

Previous studies have shown that user characteristics such as age, gender and prior interests might have an impact on search behaviour and therefore performed detailed analysis on all three factors.

4.3.1 Age Influence

The sample was broken into two age classifications; users under 22 years of age and those 22 and over. We compared the different age groups in terms of their glance duration per Area of Interest.

Age had no significant influence on search behaviour in our sample.

While the 22+ group spent slightly more time on tasks in general, we could not find any major significant difference between the two groups. One difference that did emerge was that the 22+ group spent more time looking at the last result (rank 10) than the 17-21 group (see Table 2).

Another interesting finding was that users under the age of 22 showed a slightly higher rate of complete scan-paths (72% vs 65%), i.e., they were more likely to explore the results in the order they were presented on the screen.

Table 2: Comparisons of glance duration (ms) between users aged 17-21 and 22+ for Google Search across all tasks (Sig. denotes significance level of two-tailed t-test).

	Age	Glance duration	Sig
Total Glance Duration	17-21	4.240	.654
	22+	4.540	
Rank 1	17-21	1.741	.255
	22+	1.387	
Rank 2	17-21	.772	.492
	22+	.670	
Rank 3	17-21	.499	.940
	22+	.508	
Rank 6	17-21	.089	.374
	22+	.139	
Rank 10	17-21	.017	.018*
	22+	.117	
Sponsored Links (right)	17-21	.018	.087
	22+	.089	
Highlighted Sponsored Links (top)	17-21	1.100	.639
	22+	1.269	
Number of Fixations	17-21	15	.555
	22+	13	

4.3.2 Gender Influence

We also examined data to ascertain if gender had any impact on search behaviour. The sample consisted of 16 male and 11 female participants.

Females are more likely to browse the results in the order presented than males.

We found that in general, gender did not influence the glance duration or the number of fixations (see Table 3). Both males and females displayed the same behaviour in terms of which result they looked at, glance duration etc. However, we found a significant difference in the way males viewed results, as they tended to skip results more often than females. Female participants had complete scan paths in 82% of cases, while the scan paths of male participants were complete in only 58% of the cases (see Figure 9). This result was consistent for both navigational tasks and informational tasks. In other words, regardless of the task given, female participants were more sequential in their viewing of the results. This is direct contrast to aforementioned previous studies (Lorigo et al., 2008) which reported the opposite behaviour.
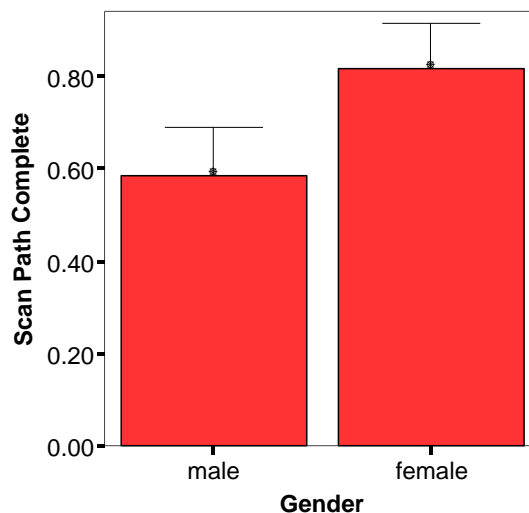
Figure 9: Mean scan-path completion across all tasks with respect to gender

Table 3: Comparisons of glance duration (ms) between male and female users for Google Search across all tasks (Sig. denotes significance level of two-tailed t-test).

	Gender	Glance duration	Sig.
Total Glance Duration	male	4.785	.304
	female	3.923	
Rank 1	male	1.080	.598
	female	1.245	
Rank 2	male	.569	.543
	female	.470	
Rank 3	male	.560	.627
	female	.473	
Rank 6	male	.108	.141
	female	.037	
Rank 10	male	.067	.227
	female	.010	
Sponsored Links (right)	male	.083	.165
	female	.007	
Highlighted Sponsored Links (top)	male	1.121	.658
	female	1.282	
Number of Fixations	male	16	.301
	female	13	

4.3.3 Prior Interest Influence

We expected that prior interest might influence the search behaviour. Being familiar with concepts and brands in a domain may help in browsing results and thus accelerate the search. For this purpose, we split the sample into three groups for each search according to the participants' interests as indicated in the pre-questionnaire. For instance, in regard to the football task, we asked participants to rate the following statement: I like football. always/sometimes/never

The search behaviour was not influenced by the users' prior interest.

While we did observe small differences in line with our expectations (i.e., shorter glance duration with higher interest), none of the differences were statistically significant (see Figure 10).

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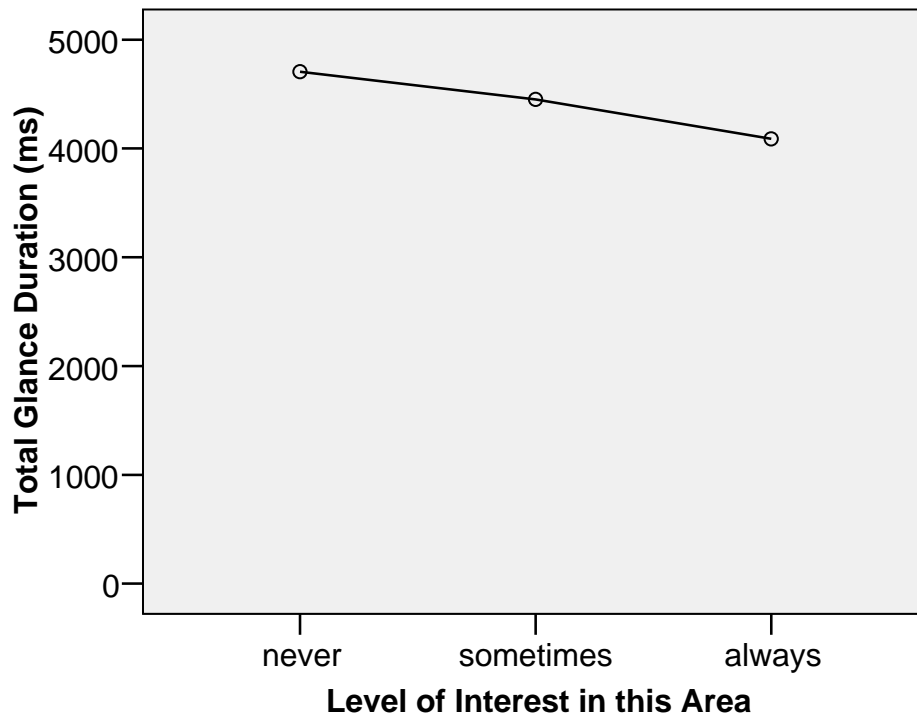
Figure 10: Comparison of glance duration (ms) according to level of interest

4.4 Influence of Task Type

Previous studies did not identify significant differences in regard to the type of task. Nevertheless, we analysed for a potential impact of this factor. Participants took about the same time to select a link (glance duration). The informational tasks, due to their open ended nature, prompted participants to explore slightly further down the page and to skip results more often (complete scan path), however, none of these differences were of statistical significance (see Table 4).

Overall, we could not identify any influence of task type on search behaviour.

Table 4: Comparison of navigational tasks and informational tasks

	Glance Duration (ms)	Lowest search Rank Explored	Complete Scan Path
Navigational tasks	4390	3.91	70%
Informational Task	4415	4.17	67%

4.5 Navigating to Bebo and YouTube

The last task required participants to go to Bebo and YouTube websites. We were interested in observing how users found these sites, whether they entered terms in the Google Search box or typed the website URL directly into the address box at the top of the page.

In the pre-test questionnaire, 50% of users stated that they had a Bebo account, while 100% of sample reported that they had used YouTube before. When asked 'What you use your computer for', 50% of users (14 participants) said they 'Always' used computers for chatting via Facebook, Bebo, Twitter etc (see Figure 11).

What do you use your computer for? Chatting via facebook, bebo, twitter etc.
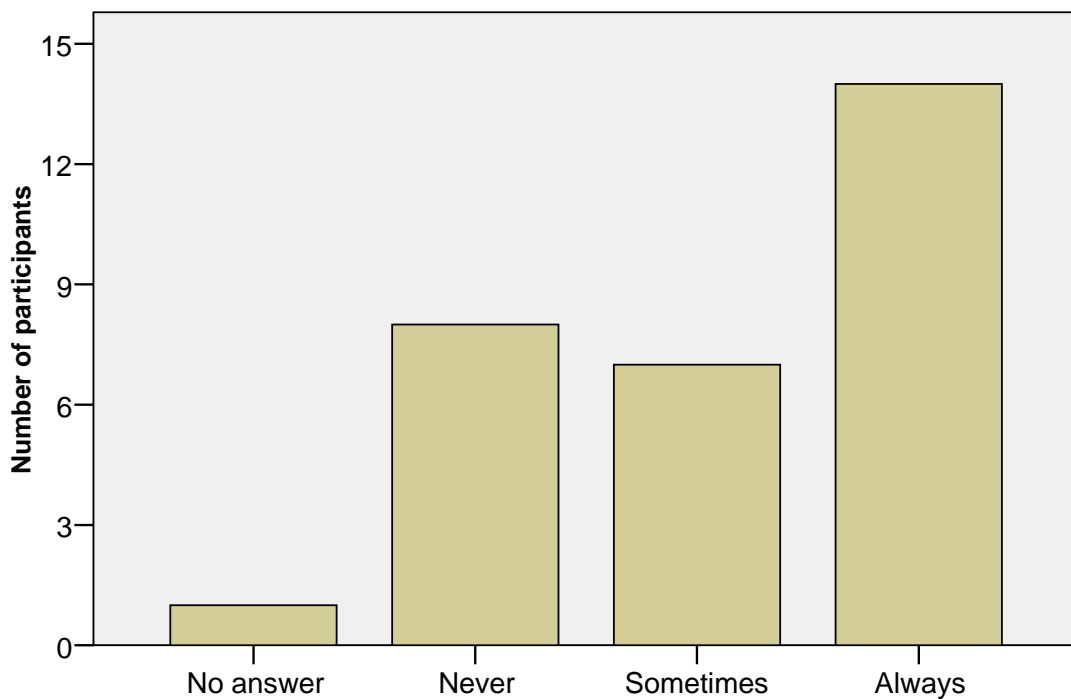
Figure 11: Pre-test questionnaire-Computer Use

Using the Google Search box was the most popular strategy for locating these websites.

As Table 5 demonstrates, when asked to go to the Bebo website, the majority of users (70%) used the Google Search box to locate the website rather than directly typing in the URL. However, only 50% of participants said they currently have a Bebo account, which might explain why so many of participants used Google search. To the contrary, 100% of users said they had used YouTube before, however many of them (59%) still preferred to use Google search to locate the website.

Analysis tells us that there is no relationship between having a Bebo account and using Google Search box (Spearman's rho=.0). However, it is interesting to note, that even when it is likely that the user knows the web address (either in case of Bebo or YouTube), it is very likely that they will still use Google Search engine to go to site rather than typing in the URL in the address bar.

Table 5: How users located websites

	Bebo		YouTube	
	N	**%**	**N**	**%**
Google search	19	70	16	59
Address bar	8	30	11	41
Total	27	100	27	100

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5 Summary

Through eye-tracking and screen interaction logging, this study analysed what users looked at when presented with the results of a Google Search page. We analysed the data to ascertain if users in this study displayed similar behaviour to those involved in a similar studies conducted in the USA. We also looked at findings to see if the users' age, gender or prior experience had any impact on their search behaviour.

After a detailed analysis of the recorded observations of 27 users of Google search we can draw the following conclusions:

1. Not surprising, the first thing that 70% of users looked at in the results page was the first result presented (whether it was sponsored link or not).

2. However, in terms of fixations and glance duration, users paid more attention relatively, to highest ranking result rather than sponsored links at the top of the page.

3. Most users ignored the sponsored link on right-hand side of the result page.

4. Users' main attention was focused on top three results only.

5. The further down the result was presented on the page, the less likely the user was to look at it.

6. If users did look beyond the first three results, then it is likely they would explore the bottom of the page also.

7. If the "solution" is not included in the top two results, users are more likely to fail finding it.

8. Though those users aged 22+ did take slightly longer to complete tasks and spent more time looking at lower ranked results, we found that age and prior interest had no significant influence on search behaviour.

9. Generally, gender did not have a big impact on search behaviour. However, we did record a significant difference in the way males viewed results. Female users recorded a higher rate of completion of scan paths; meaning females viewed results in a more linear manner, while we found that males were more likely to skip results when looking at the search page.

10. When asked to go to Bebo or YouTube, even though it is likely that the user should know the web address, it is very likely that they will still use Google Search engine to navigate to the website site rather than typing in the URL in the address bar.

These results broadly mirrored those found in previous US studies in the area, though we did see some differences in behaviour emerge in terms of how much attention users gave to the highest ranking result and how gender influenced the way users viewed results. We found that 70% of our users fixated on the highest ranking result, while previous studies report that uses gave equal attention to the top two results. The female rather than male participants in our study were more sequential in their viewing of results, which is in direct contrast to a previous US study which found that males were more likely to explore results in a linear fashion.

6 References

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Appendix 1: User Instructions

The following user instructions were presented to the users during testing in the form of pop-up messages on the computer monitor.

Example

Please find the homepage of NCI.

1. Put in the search terms "National College of Ireland"

2. Choose the relevant link in the search results

3. Follow the link to the homepage

Press space bar to continue.

Task 1 (navigational)

Please find the homepage of Liverpool Football Club.

Search terms: "Liverpool football"

press space bar when you are ready to continue

Task 2 (navigational)

Please find the homepage of MAC cosmetics UK

Search terms: "MAC cosmetics UK"

press space bar when you are ready to continue

Task 3 (navigational)

Please find the homepage of Irish Independent newspaper.

Search terms: "news Ireland"

press space bar when you are ready to continue

Task 4 (informational)

You are interested in finding a job.

Search terms: "jobs Ireland"

From search results, choose the link that is most relevant to you.

press space bar when you are ready to continue

Task 5 (informational)

You are interested in buying a car.

Search terms: "cars Ireland"

From search results, choose the link that is most relevant to you.

press space bar when you are ready to continue

Task 6 (informational)

You are interested in booking a flight to Edinburgh.

Search terms: "flights Dublin to Edinburgh"

From search results, choose the link that is most relevant to you.

press space bar when you are ready to continue

Task 7

You have a Bebo account.

Go to the Bebo homepage.

press space bar when you are ready to continue

Task 8

You would like to watch a video on You Tube.

Go to the You Tube homepage.

press space bar when you are ready to continue

Appendix 2: User Questionnaire

The following user questionnaire was presented to the users at the beginning of testing in the form of a website survey.

Figure 12: Introduction Screen to obtain Gender and Age of user

Figure 13: Interests and Computer Screen to obtain the Level of Interest in Subject Matters and Computer Usage information.

Figure 14: Previous Experience Screen to obtain information on the users' prior experience in using Google Search

Appendix 3: Heat Maps

The following image show the heat maps aggregated across all users for each task. Heat maps visualise the fixations using the colour scale between violet (less hits) and red (most hits). Red areas received most attention by users.

Task 1

Mulley Communications

Task 2

Mulley Communications

Task 3

Task 4

Task 5

Task 6