A Survey of Temporal Web Search Experience

Hideo Joho*
Faculty of Library, Information
and Media Science / Research
Center for Knowledge
Communities, University of
Tsukuba, Japan
hideo@slis.tsukuba.ac.jp

Adam Jatowt†
Department of Social
Informatics, Graduate School
of Informatics, Kyoto
University, Japan
adam@dl.kuis.kyoto-u.ac.jp

Roi Blanco
Yahoo! Research
Barcelona, Spain
roi@yahoo-inc.com

ABSTRACT

Temporal aspects of web search have gained a great level of attention in the recent years. However, many of the research attempts either focused on technical development of various tools or behavioral analysis based on log data. This paper presents the results of user survey carried out to investigate the practice and experience of temporal web search. A total of 110 people was recruited and answered 18 questions regarding their recent experience of web search. Our results suggest that an interplay of seasonal interests, technicality of information needs, target time of information, re-finding behaviour, and freshness of information can be important factors for the application of temporal search. These findings should be complementary to log analyses for further development of temporally aware search engines.

Categories and Subject Descriptors

H.3.3 [**Information Search and Retrieval**]: Search process

General Terms

Human Factors

Keywords

Survey, Temporal Web Search, User Experience

1. INTRODUCTION

Significant number of user search queries have strong temporal component or characteristics. These are searches for freshest information, searches for information on the past or expected events, searches whose underlying intent depends on time or searches driven by recent, long term or periodical information needs and so on. These different temporal dimensions of user search activities are often correlated and influence each other. Although much effort has been made to design ranking [1, 2, 7] or indexing [3] algorithms for information of temporal character, there is a need for deeper understanding of temporality involved in user searches. The knowledge of interplay between temporal dimensions in user searches could constitute valuable source of information for search engines that continuously strive to satisfy user needs. Morris [11] is a good example of such survey conducted for collaborative search practice.

*Corresponding Author
†Also affiliated to Japan Science and Technology Agency (JST), 4-1-8 Honcho, Kawaguchi-shi, Saitama, 332-0012 Tokyo, Japan.

In this paper we report results of a recent questionnaire study that we administered on 110 people in order to shed light on temporal characteristics of user web search activities. The study involves a broad range of aspects in order to provide an explorative framework for analyzing temporality associated with user search behavior. We have questioned a relatively large number of users over diverse demographic categories to accurately represent searchers' population. Among others, the questionnaire contained questions on the required freshness levels of searched information, re-searching activities, time horizon of searched information or the time of planned actions resulting from the searches. Based on the results we have managed to confirm some existing hypotheses as well as discover new, interesting findings. The results will broaden our knowledge on user search and should have direct implications on designing temporally aware search algorithms.

The reminder of the paper is composed as follows. In the next section we outline the related work. Section 3 describes the methodology behind the questionnaire, while Section 4 describes the obtained results. We provide concluding discussions in Section 5.

2. RELATED WORK

Temporal aspects in search have recently received considerable attention in research community. Temporal Information Retrieval [1, 6, 7, 4, 2, 9, 10, 13, 12, 8] has started to be considered as a subdivision of the field of information retrieval. Alonso *et al.* [1] provide the overview of temporal information retrieval and its promising future directions.

Users searching the web may require documents describing the past (e.g. biographies of historical persons), documents containing the most recent, up-to-date information (e.g. information on weather or traffic conditions) or future-related information (e.g. information on planned events or speculations). According to Metzler et al. [10] about 7% of queries have some kind of temporal intent. Significantly higher number of 54% queries has been reported by Jones and Diaz [6]. Temporal queries may either contain explicitly or implicitly specified temporal intent. The former contains explicit date or temporal expression that can be mapped onto timeline (e.g., "Euro Cup 2012", "latest US presidential elections"). Nunes *et al.* [12] found that the number of such queries is about 1.5%, although subsequent studies [4] re-estimated this amount to 1.21% after removing false positive queries (e.g. "Windows 1998"). On the other hand, implicit temporal queries do not contain explicit date although they still point to certain time period(s) (e.g., "Summer Olympics"). Jones and Diaz [6] further categorized implicit temporal queries into temporally ambiguous and unambiguous.

Another type of queries with significant temporal aspect are recency queries. For these queries users expect uptodate and recent documents. While temporal queries have associated given, under-

lying time point or time period, for recency queries there is no such fixed time point or period. For example, queries "Kyoto weather" and "dollar yen rate" require very fresh content that is uptodate with respect to the query issuing time. On the other hand, users searching, for example, with queries "relativity theory" or "Einstein life" usually do not require very fresh information.

There is also a class of time-sensitive queries whose temporal component and expectation of search results vary over time. Consider query "Halloween" issued at the end of October or, in another case, on some other distant day. In the former case, the user may be interested in Halloween parties or costumes to buy, while in the later he or she may just seek general information about the Halloween tradition or about the movie. [9] analyzed query intent change during 10 weeks concluding that only few of time-sensitive queries can be classified into periodic query type. [13] proposed method based on time series analysis for detecting seasonal queries (e.g., "Halloween") reaching precision of 0.78.

While considerable work has been done in the context of temporal query classification there is still lack of user studies that would analyze user behavior in temporal search from diverse viewpoints. Some attempt in this direction has been undertaken by Khodaei and Alonso [8] who proposed incorporating time as aspect when investigating social search. They categorized user social interests into five classes: recent, ongoing, seasonal, past and random, and then analyzed Twitter as well as Facebook data on social activities of example users. Another work [14] looked into the refinding behavior on the Web based on both query log studies and controlled survey finding that 40% of all queries are refinding queries.

In this work we try to provide deeper insight into temporal user needs during search process, the way in which users incorporate temporal component into their queries, the context of such queries as well as the level of satisfaction, problems and subsequent activities based on the returned search results.

3. METHODOLOGY

The survey was based on a variant of critical incident analysis (CTI). CTI has been widely used in Social Science to elicit contexts and factors that influenced people's behaviour, by asking them to describe the experience of interest. Although CTI is usually conducted by interviewing participants, Evans and Chi [5] successfully applied the method to questionnaires to investigate people's perceptions and behaviour regarding social search. Our approach is similar to [5] where we asked participants to describe various aspects of their latest search performed on the web.

An advantage of CTI-type of survey is that we can elicit a user's search intention, satisfaction and subsequent behavior. It is difficult to statistically infer this data from query logs despite their advantage of data quantity. Therefore, the findings of our survey should be seen as a complementary to existing query log analysis studies. It should also be mentioned that the findings of our survey are meant to provide a better understanding of temporal search experience. Therefore, some findings might have already been addressed technically, while others might require more resources than query logs such as search interfaces.

A total of 110 participants (55 females and 55 males) were recruited in Japan by a third-party agency[1] so that 11 females and 11 males were sampled from each of 20's to 60's blocks (i.e., 22 from 20's, 22 from 30's, etc.). Since we were interested in people's web search experience, a pre-filtering was also carried out to pool those who conducted any form of web search in the last three days. Of 110 participants, 48 (43.6%) were single and 62 (56.4%) were

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[1]Macromill Inc. (`www.macromill.com`)

Table 1: When did you perform the last search?

Answers	Frequency	Percentage
Within an hour	47	42.7%
Within several hours or today	42	38.2%
Yesterday	17	15.5%
Two days ago	3	2.7%
More than two days ago	1	0.9%
Total	110	100.0%

married. Their self-reported occupations varied from managers (2), to office workers (36), self-employed (12), homemakers (21), part-time workers (15), university students (8), and others (16).

The survey consisted of 18 questions, and the translation of the actual questions and answer sets are shown in Appendix A. As can be seen from the Appendix, our survey contained several qualitative questions for participants to describe additional contextual information. However, due to limited space, we focus on quantitative analyses in this paper, while a comprehensive analysis is planned to be reported elsewhere.

4. RESULTS

This section presents the results of our survey. The results were broadly categorised into three groups such as context, information needs, and search process and outcome. We will also report the findings from the correlation analysis of the four groups.

4.1 Context

The survey questionnaires started by asking contextual information about user search experience. The first question we asked was the time lag between the last search participants performed and the time of answering the questionnaires. The result is shown in Table 1. As can be seen, over 95% of participants answered the questionnaires based on their search experience of no later than 48 hours. Therefore, we can consider that the analysis is derived from fairly recent search experience. The second and third question asked the device used and location of search. The results are shown in Table 2. Most participants performed the search indoor at home or office. The proportion of the search devices was well distributed over desktop PCs, laptop PCs, and mobile devices (incl. smartphones). A relatively small proportion of mobile devices is due to the samples from 50's and 60's.

The last question of the context part asked whether or not participants performed the search with someone else collaboratively. The answer set had family or relative, friend, colleague, other, as well as alone (i.e., with no one). The results show that all participants answered that they performed the search alone, although some reported that they searched on behalf of family members.

To summarize, participants were mostly indoor and performed the search alone. Younger populations used desktop PCs, laptop PCs, and mobile devices, while elder populations rarely used mobile devices. These results suggest that participants in this survey share common characteristics with general populations.

4.2 Information need

The following were questions asked to elicit temporal and other characteristics of participants' information needs. The first question in this group asked the target time of information they were searching (e.g., information about yesterday, today, or tomorrow),

Table 2: Device used and location of search.

What did you use to search?	Frequency	Percentage
Desktop PC	39	35.5%
Laptop or tablet PC	55	50.0%
Mobile devices	16	14.5%
Others (Please specify)	0	0.0%
Total	110	100.0%

Where did you search?	Frequency	Percentage
Home	89	80.9%
Office	16	14.5%
Airport, station, bus stop	2	1.8%
Shop	0	0.0%
Outdoor	3	2.7%
Others (Please specify)	0	0.0%
Total	110	100.0%

Table 3: Target time of information.

Answers	Frequency	Percentage
Information older than 1 year	9	8.2%
One year ago	0	0.0%
Several months ago	5	4.5%
Several weeks ago	2	1.8%
Last week	2	1.8%
Several days ago	9	8.2%
Yesterday	9	8.2%
Today	53	48.2%
Tomorrow	1	0.9%
Several days later	5	4.5%
Next week	0	0.0%
Several weeks later	1	0.9%
Several months later	1	0.9%
One year later	0	0.0%
More than one year later	1	0.9%
Others (Please specify)	12	10.9%
Total	110	100.0%

Table 4: Please select one that describes the information you were searching for.

Answers	Frequency	Percentage
About a topic that I'm interested in continuously for a relatively long time (e.g., hobby, education, study, work)	26	23.6%
About a topic that I'm interested in repeatedly in a particular interval (e.g., sport or music events)	23	20.9%
About a topic that I'm interested in recently	45	40.9%
Others (Please specify)	16	14.5%
Total	110	100.0%

from participants we found that several seemed to be motivated by news articles they were reading or TV programs they were watching. Some were motivated by the conversation with family members or friends. However, nearly 45% of their needs were related to either long-term interests or seasonal interests. This result again reinforces the importance of temporal features in search, and provides empirical support for the development of user profiles that exploit different aspects of their needs such as long-term and seasonal interests.

The rest of the questions in this section asked the importance of freshness of information, re-finding, and technicality. Table 5 shows the results. As suggested in the previous sections, freshness of retrieved information was found to be important for many participants. The proportion of re-finding behaviour noticeably exceeded new search behaviour. This seems to echo the result of seasonal needs shown in Table 4 and is correlated with findings described in [14]. Correlation analyses of these factors will be presented in Section 4.4. Finally, most information needs were regarded as general information by participants. However, the proportion of technical (professional) needs was not so negligible.

To summarise, the findings of our survey reinforced several aspects of information needs. They indicate that recency is one of the major component of participants' information needs, and that continuous and seasonal needs are as popular as recently occurred interests, and that re-finding behavior is common and participants often regards that freshness of retrieved information is important for their needs.

4.3 Search process and outcome

The next few questions asked participants to describe their search process including completion time, outcome, difficulty encountered, information use, and satisfaction. The first question asked in this group was about the perceptional length of search, and the result is shown in Table 6. Nearly half of participants reported that their search lasted less than five minutes. Over 75% of participants spent less than 10 minutes. However, that still means that a good proportion of users took more than half an hour for search in our results. Interestingly, though, little pattern was observed between the self-reported search time and their age group.

The next two questions asked whether or not they found relevant information or not, and any difficulties they encountered during the search (multiple choices). The results are shown in Table 7. Over 75% of participants reported to find relevant information and 22.7%

and the result is shown in Table 3. As can be seen, nearly half of participants (48.2%) sought for information about the same day as they performed the search. 32.7% of participants were looking for past information, and 8.1% were looking for future information. 10.9% of participants answered that their information needs did not have specific temporal attributes (i.e., atemporal). The examples of non-temporal information needs include a fax number of a shop, definition of words, recipes, information about products, and so on. This result reinforces the importance of recency in people's information needs. It should also be emphasised that rather a negligible proportion of users were searching for future information.

The next question asked the seasonal nature of information needs such as continuous interests, seasonal interests, recent interests, and others. The categorisation of seasonal needs was based on the one proposed in the work of Khodaei and Alonso [8]. The result is shown in Table 4. The largest proportion of needs was related to recently interested topics (40.9%). From the additional comments

Table 5: Freshness, re-findability, and technicality of information needs.

Freshness	Frequency	Percentage
Freshness was important	67	60.9%
Freshness was not so important	43	39.1%
Total	110	100.0%

Re-finding	Frequency	Percentage
Have searched before	72	65.5%
Have never searched before	38	34.5%
Total	110	100.0%

Technicality	Frequency	Percentage
Searching technical information	16	14.5%
Searching general information	94	85.5%
Total	110	100.0%

Table 6: How long did it take to complete the search?

Answers	Frequency	Percentage
Less than 5 min	50	45.5%
5 min to 10 min	34	30.9%
10 min to 30 min	16	14.5%
30 min to 1 hour	3	2.7%
More than 1 hour	3	2.7%
Can't remember	4	3.6%
Total	110	100.0%

Table 7: Relevant information found and difficulties encountered.

Rel Info Found	Frequency	Percentage
Yes	83	75.5%
Partially	25	22.7%
No	2	1.8%
Total	110	100.0%

Difficulties encountered	Frequency	Percentage
I was not sure which website to use for searching	10	8.8%
I was not sure what query I should use for searching	27	23.9%
It was hard to find relevant information from search results	40	35.4%
Other (Please specify)	36	31.9%
Total	113	100.0%

Table 8: When did you plan to use the information you were searching?

Answers	Frequency	Percentage
Right away	28	25.5%
Within the day	18	16.4%
Within 2-3 days	26	23.6%
Within next week	2	1.8%
Within several weeks	9	8.2%
Within next month	2	1.8%
Within several months	2	1.8%
Within a year	1	0.9%
Later than a year	1	0.9%
No plan	21	19.1%
Total	110	100.0%

Table 9: In overall, how satisfied were you about the search?

Answers	Frequency	Percentage
Very satisfied	14	12.7%
Satisfied	77	70.0%
Either	17	15.5%
Not satisfied	2	1.8%
Not satisfied at all	0	0.0%
Total	110	100.0%

of participants partially found some useful information. However, two thirds of participants encountered some sort of difficulty during the search. This suggests that there is still room for improving user experience of web search. Again, the relationship with other factors will be reported in the following section.

Another temporal aspect of web search is information use. This is not the same as target time of information presented in Table 3. This question asked when participants were planning to use the information they found, and the result is shown in Table 8. A slightly unexpected result was that only one in four participants reported that they were planning to use the found information immediately. A total of 40% of participants appeared to plan to use the information within the day or few days. Furthermore, more than 10% of participants were searching for information that would not be used for several weeks. Finally, 19.1% of participants did not have any plan to use the information. This proportion is larger than the result of atemporal needs in Table 3 (10.9%).

Table 9 shows the result of user satisfaction. Most participants (82.7%) were either very satisfied or satisfied with their outcome. Two participants who did not found relevant information (see Table 7) indicated "Either", and those who indicated "Not satisfied" were the participants who found partially relevant information. The next section discusses how these individual results correlate one another.

4.4 Correlation analyses

To further understand participants' search experience, we performed a series of correlation analyses in the following manner.

First, we measured a gross correlation of all closed questions using Spearman's rank correlation. All answer sets (i.e., (a), (b), (c), etc.) were first converted to ordinal numbers (i.e., 1, 2, 3, etc.), and coefficient was calculated for each of the pairs with an alpha level of $p \leq .05$. This gross correlation was not meant to be conclusive findings, but simply to allow us determining significant pairs of questions to have a closer look in the subsequent analyses. The results of the gross correlation are shown in Table 10.

Table 10: Gross Correlation analyses by Spearman. Question number are based on Appendix A. Significant correlation ($p \leq .05$) is highlighted.
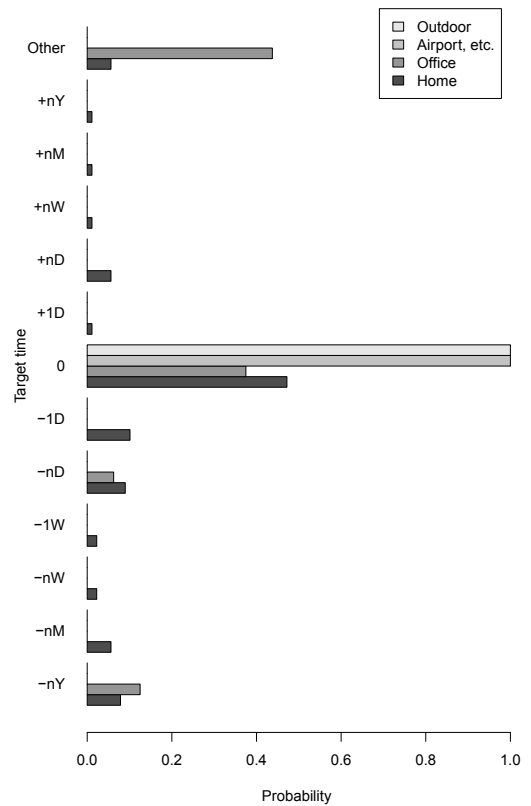
	Q2 Device	Q3 Location	Q5 Target	Q6 Season	Q7 Specific	Q8 Fresh	Q9 Re-find	Q12 Clarity	Q13 Use	Q14 Time	Q15 Found
Q2 Device to search	1.00										
Q3 Location of search	-0.04	1.00									
Q5 Target time of information	-0.14	**0.22**	1.00								
Q6 Seasonal needs	**-0.22**	0.08	**0.20**	1.00							
Q7 Specificity of needs	0.08	-0.01	**-0.20**	**-0.20**	1.00						
Q8 Freshness of needs	-0.07	-0.06	-0.04	0.11	**0.30**	1.00					
Q9 Re-findability	-0.08	0.04	0.06	**0.18**	-0.03	**0.24**	1.00				
Q12 Clarity of needs	0.05	0.03	-0.04	-0.10	-0.09	-0.05	-0.07	1.00			
Q13 Information Use	-0.08	-0.14	-0.07	-0.04	0.01	-0.09	-0.08	**0.24**	1.00		
Q14 Time taken to search	-0.02	-0.14	0.03	-0.08	0.06	-0.11	**-0.22**	**0.27**	0.16	1.00	
Q15 Rel doc found	-0.12	0.00	-0.03	0.05	0.13	0.11	-0.14	**0.39**	**0.19**	**0.25**	1.00
Q18 Satisfaction	-0.15	0.10	-0.02	-0.02	0.11	-0.07	-0.06	**0.39**	0.09	**0.26**	**0.47**
	Device Q2	Location Q3	Target Q5	Season Q6	Specific Q7	Fresh Q8	Re-find Q9	Clarity Q12	Use Q13	Time Q14	Found Q15
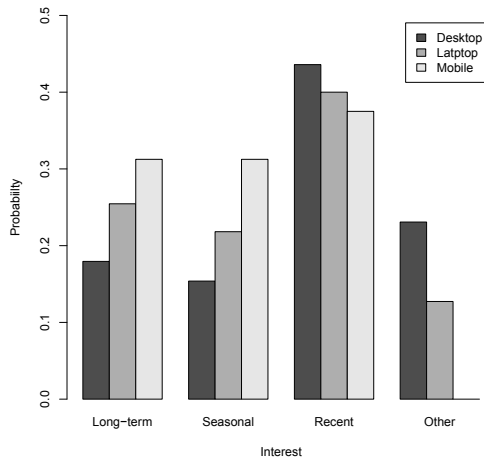
Figure 1: Device (Q2) vs. Seasonal Interest (Q6).

Figure 2: Target time (Q5) vs. Location (Q3). 0 is Today, +1D is tomorrow, +nD is several days ahead, -nW is several weeks ago.

As it can be seen, there are quite a few pairs of questions with a statistically significant correlation, although the level of correlation was relatively low in many pairs ($\rho = \pm 0.18 - \pm 0.47$). The rest of this section will look at those significant pairs by breaking down the individual results.

The first relationship we looked at was the search devices and seasonal interests, and the result is shown in Figure 1. Since the information need on recently interested topics had the largest proportion, the probability of searching for the recent interests is the highest in all three devices. However, we can also notice that laptop PCs and mobile devices had a greater level of use in long-term interests and seasonal interests than desktop PCs. Another example of contextual analysis is the relationship between the location of search and target time of information (See Figure 2). All participants, who performed the search at the transportation stops or outdoor, sought for the information about the same day. The result also suggests that the search from the office rarely sought for future information.

The relationship between the seasonal interests and technicality of information needs had also noticeable contrasts (Figure 3). For the recently interested topics, the proportion of general and technical information is similar, while half of participants who sought
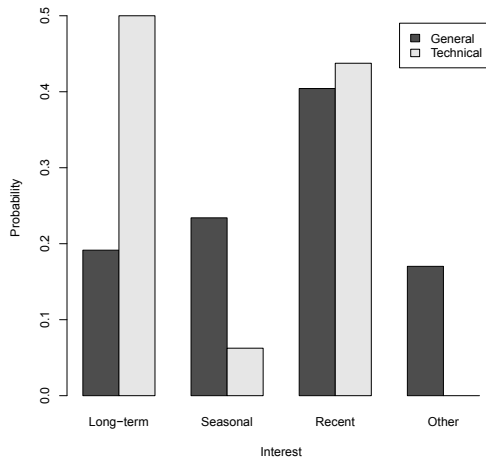
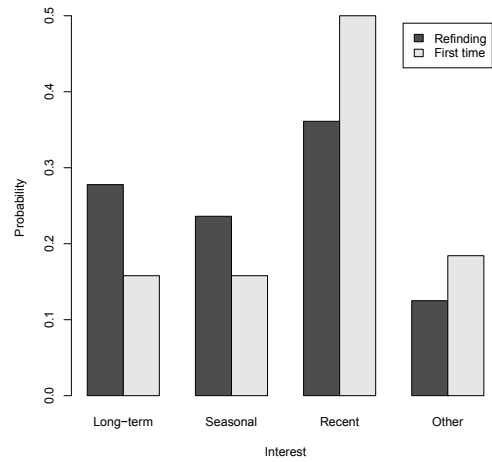**Figure 3: Technicality (Q7) vs. Seasonal Interest (Q6).**
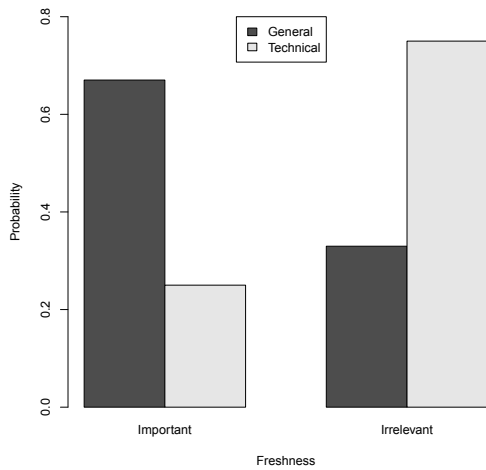

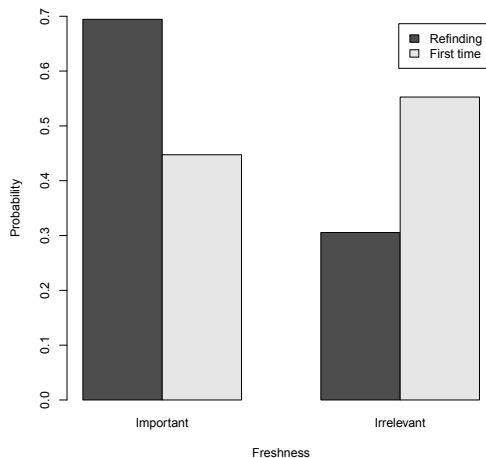**Figure 4: Freshness (Q8) vs. Technicality (Q7).**

Figure 5: Refinding (Q9) vs. Freshness (Q8).

for technical information were related to long-term interests, and rarely to seasonal interests. Some results were intuitive. For ex-

Figure 6: Refinding (Q9) vs. Seasonal Interest (Q6).

ample, participants who sought for general information tended to appreciate freshness of the information, while technical information is more independent from such requirement (Figure 4). Another example is the relationship between the re-finding behaviour and importance of freshness (Figure 5). For those who searched the topic for the first time, the importance of freshness is more or less the same. On the other hand, the freshness of information was reported to be fairly important for those who did re-finding on the same topic. This could include a monitoring type of search tactics such as selective dissemination of information (SDI).

Not all results are intuitive, however. For example, Figure 6 shows a similar proportion of re-finding behavior observed across the seasonal categories (long-term, seasonal, and recent). This suggests that whether a search is re-finding or new search does not necessarily allow us to elicit seasonal interests. There have been prior studies related to this topic (e.g., [9]), but this result highlights the importance of the interval analysis of re-finding queries to separate long-term and seasonal interests, On the other hand, nearly half of the first time search was about recently interested topics.

A related comparison is the relationship between the technicality and target time of information, and the result is shown in Figure 7. Here there is clear pattern that participants who sought for technical information rarely needed future information, and all future information needs were categorised as general information by participants.

The final set of rather intuitive results from the correlation analyses was the relationship among the clarity of information needs, time taken to search, relevant information found, and overall satisfaction (See Table 10). When participants were clear about what they were searching, they tended to take less time, and were more likely to find relevant information, and a higher level of satisfaction. These results are common to many types of web search, and thus, we do not discuss them in detail.

5. CONCLUDING DISCUSSION

This paper reported the preliminary findings of the survey conducted to gain an insight into temporal aspects of web search experience. A variant of critical incident analysis technique was adapted and 110 participants' recent web search experience were elicited using 18 questions. The major findings and their implications from the quantitative analyses of the survey were as follows.
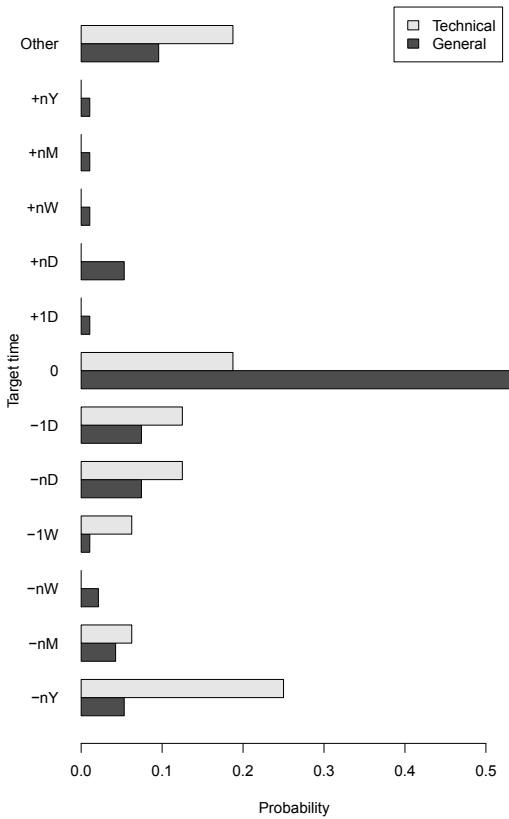
Figure 7: Target time (Q5) vs. Technicality (Q7).

First, the results reinforced the significance of recency of retrieved information. Nearly half of participants were looking for the information about the same day of search. However, the results also suggest that efficient retrieval of past and future information should not be underestimated since a good proportion of participants sought for such information. A related potential challenge indicated by the results were the gap between the time of retrieval and use of the retrieved information. How can we notify users when the value or temporal relevance of information change between the search and use of information?

Second, although people continue to search for the topics they were recently interested, a good proportion of information needs can be related to seasonal interests and continuous interests. This highlights the importance of further investigation to model the two types of temporal queries.

Third, the results provide some evidence to reinforce that context such as search devices and locations could be exploited to elicit temporal aspects of information needs such as seasonal interest and target time of information. Furthermore, seasonal interests, technicality of information needs, target time of information, re-finding behaviour, and freshness of information appear to all interplay to formulate temporal aspects of web searches. Interaction effects of these factors seem to be a good starting point to further improve temporally-aware retrieval techniques and services.

Finally, we should clarify the limitations of our work. This survey, although conducted in a well structured way to recruit participants, was based on people in a particular region with a particular language. While no result exhibits cultural bias in the responses, further investigation with different populations should be carried out for the comprehensive understanding of temporal web search experience.

6. ACKNOWLEDGEMENTS

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APPENDIX

A. QUESTIONNAIRE

1. When did you perform your last search? Please select the closest one.

   (a) Within one hour
   (b) Within several hours or today
   (c) Yesterday
   (d) Two days ago

    (e) More than two days ago

2. What did you used to perform the search?

    (a) Desktop PC

    (b) Laptop PC or tablet PC (e.g., iPad)

    (c) Mobile phones or smart phones

    (d) Other (Please specify)

3. Where did you perform the search?

    (a) At home

    (b) At office

    (c) At airport, station, bus stop, etc.

    (d) At shop

    (e) Outside

    (f) Other (Please specify)

4. Who did you perform the search together?

    (a) No one (alone)

    (b) With families or relatives

    (c) With friends

    (d) With colleagues

    (e) Other (Please specify)

5. Please select the closest one to describe the information you were searching.

    (a) Information about more than one year ago

    (b) Information about one year ago

    (c) Information about several months ago

    (d) Information about several weeks ago

    (e) Information about last week

    (f) Information about several days ago

    (g) Information about yesterday

    (h) Information about today

    (i) Information about tomorrow

    (j) Information about several days ahead

    (k) Information about next week

    (l) Information about several weeks ahead

    (m) Information about several months ahead

    (n) Information about a year ahead

    (o) Information about several years ahead

    (p) Other (Please specify)

6. Please select the closest one to describe the information you were searching.

    (a) Topic with long-term interests (e.g., hobby, kids, study, work)

    (b) Topic with seasonal interests (e.g., music or sport events)

    (c) Topic with recent interests

    (d) Other (Please specify)

7. Please select the closest one to describe the information you were searching.

    (a) General information

    (b) Technical (Professional) information

8. Please select the closest one to describe the information you were searching.

    (a) Freshness of information was important (e.g., news)

    (b) Freshness of information was irrelevant (e.g., definition of words)

9. Please select the closest one to describe the information you were searching.

    (a) I have searched this information before

    (b) I have never searched this information before

10. What were you doing right before the search? Please describe in detail.

11. What made you to perform the search? Please describe in detail.

12. How clear were you about the information you were searching?.

    (a) Very clear

    (b) Clear

    (c) Either

    (d) Not so clear

    (e) Not clear at all

13. When were you planning to use the information that you found?

    (a) Right after the search

    (b) Within the day

    (c) Within 2-3 days

    (d) Next week

    (e) Within several weeks

    (f) Next month

    (g) Within several months

    (h) Next year

    (i) More than next year

    (j) No plan

14. How long did it take to complete the search?

    (a) Less than five minutes

    (b) Five to ten minutes

    (c) Ten to thirty minutes

    (d) Thirty minutes to one hour

    (e) More than one hour

    (f) I can't remember

15. Did you find the information you were looking for?

    (a) Yes

    (b) Partially

    (c) No

16. What difficulty did you encounter during the search?

    (a) I was not sure which search engine to use.

    (b) I was not sure what keyword I should use.

    (c) It was hard to find relevant information from search results.

    (d) Other (Please specify)

17. What did you do right after the search? Please describe in detail.

18. How satisfied were you about the search?

    (a) Very satisfied

    (b) Satisfied

    (c) Either

    (d) Not so satisfied

    (e) Not satisfied at all