

An Investigation into a Personalised and Web2.0-Based Search Engine Interface

Tsai-Hsuan Tsai¹, Hsien-Tsung Chang², and Shih-Ting Huang¹

¹ Department of Industrial Design, Chang Gung University, Taoyuan, Taiwan

² Department of Computer Science and Information Engineering, Chang Gung University,
Taoyuan, Taiwan,
ttsai.cgu@gmail.com

Abstract. This study aims to investigate user behaviours and preferences for the usage of search engine interfaces and to provide a user-centred search engine interface with various functions and services that cater to user needs and personalisation along the Web2.0 trend. A survey was conducted to examine the relationship between user behaviours and interface needs for Web2.0 search engines. Some influential factors in association with user issues and Web2.0 concepts were proposed as design principles for a personalised search engine interface design. Then, a conceptual search engine interface, which matched the theory-driven principles and practical experiences, was developed. It matches the concept of user-orientated services and provides every user with personalised search engine interface that offers mash-up search results and multiple functions. Users are allowed to share search results while using a personalised interface. Through the new concept of search engine interface, the convenience of the search process will include more convenient search procedures that meet personal needs.

Keywords: search engine interface, user behaviours, Web2.0.

1 Introduction

Search engines have become one of the most important and most frequently used services, heavily influencing the way users perceive the Internet [1-3]. Google [4], the most widely used Web-based search engine in the world, began in 1998. Google has stood atop the usage rate of search engine since 2001. In 2011, Google boosted over 90% of its worldwide usage rate and stood number one among search engines [5]. Google's user interface, presenting search results in a listing manner, has thus been leading display styles of most search engines and how users have used search engines. That is, users are very accustomed to Google's result display. Correspondingly, some familiar search engines, such as Yahoo [6] and Bing [7], display "Google-like" content search results.

However, many search engines offer users a myriad of small tools and features in their interfaces with an emphasis on enriched user interactions. In response to Web2.0 related functions and technical development, search engines have been upgraded to

include various features. For instance, some search engines use the modular functionality of Web 2.0; for example, mashup and tagging, such as FundooWeb [8]; KartOO [9] offers rich internet application search interfaces; Omgili [10] connects with social aspects—user contribution, recommendation, and social networks. It characterises Websites of Web2.0 where users are allowed to not only participate and share but also create, revise, and post Website content [11-13]. With Web2.0 related techniques and core concepts, search engines offer users more accuracy and diversity. They also constantly develop individual features and different user interfaces. Hence, in spite of Google's dominance on the current search engine interface display, with the trend of Web2.0, users are offered interfaces with various features and integrated applications that come from different sources [14]. Users are no longer play a passive role in receiving messages; they are an active part of the creation and contribution to content through interactive sharing [15-16]. However, these search engines just reached a 1% worldwide usage rate among search engines [5].

Boulos et al. [17] point out that search engines play a significant role in Web2.0 applications. The composition of user interfaces is thus the major part of search engines for users [18]. User interfaces are the key for users to operate search engines. Moreover, user experience and preferences in search engine interfaces deserve attention and consideration to keep up with current user needs. In the 11th IEEE International Conferences on Computer-Aided Design and Computer Graphics [19], we proposed the following views about search engine interfaces: (1) search engine as an intermediary between for the user; (2) output results according to different queries; (3) implementing Web2.0 concepts; (4) integrated interface and personalised methods of operation.

User input is important in obtaining a good understanding of user behaviours for exploring search engine interface needs. These behaviours include habitual practice and preferences when interacting with the Web and search engines. A user-centred approach has become the core of current user interface designs. Despite some Web design guidelines and some search engines that combine Web2.0 applications cater to the current Web trends. There is a lack consideration of user habits and preferences in the usage of search engine interfaces today. How user habits and user acceptance correspond to each other is also not taken into consideration. Search engine interfaces should not only focus on the development of individual functions but also on the usability of interfaces and user needs and experiences in current Web trends. User behaviour patterns should be introduced and integrated into related services of today's Web2.0 to develop search engine interfaces that will greatly serve users.

In order to investigate user needs and preferences for the usage of search engine interfaces in the current trends of Web2.0 and to propose a user-centred user interface for search engines, the study conducts a survey on user needs and preferences for the usage of search engine interfaces in the current trends of Web2.0.

2 User Habitual Practice and Preference under the Prevalence of Web2.0

This study aims to obtain a better understanding of user behaviours when interacting with search engines and their needs in search engine interfaces. Through identifying

the relationship between user practice, preferences, and the features of Web2.0, we will provide design factors for search engine interface designs.

The study practically identifies the frequency of use, type, user preferences, and habitual practices for search engine usage through questionnaires and analyses to ascertain user needs for functions, use experiences, and personal preferences of current search engine interfaces and to understand the impact of Web2.0 trends on users, which will lead to the identification of design factors for search engine interfaces.

2.1 Design and Procedure

A questionnaire was employed in the survey. 415 participants were randomly distributed from colleges and universities in Taiwan. Survey participants target general user groups of search engines in that user habitual practices and needs are more likely found in such groups. Based on Pew's Internet report [20], young people aged 18-29 present with the highest usage rate of search engines usage. Therefore, it has become one of the criteria of participant selection. There are 415 participants aged 18 to 29, 247 males and 168 females; the average age is 22, and 331 persons are undergraduate students. Moreover, 100 are postgraduate students, 3 are in high school, and 1 is a research student; nearly 100% of the participants are students, and two-thirds have more than 8-year experience using Internet. This equates to a search engine usage rate of nearly 100%.

The questionnaire mainly examines user needs for search engine usage and user experiences on Internet; the former includes user habitual practices, query input functions, and search results displays of search engines, and the latter includes user preferences and specific Internet needs. To ensure questionnaire reliability, there are two pre-tests prior to the formal distribution, and each time, we use about five questionnaires to test unclear terms and time spent.

2.2 Survey Results and Analysis

- Search engine usage among young generations in Taiwan

Of the 415 users of search engines in Taiwan, Yahoo! and Google score the highest, with a usage rate of over 60% (Table 1). "Everyday" accounts for the highest usage frequency for about two-thirds of search engine users. The most frequently searched content of the first three are report information, everyday knowledge, and academic research. Searches for information have become the most frequently searched content for users (Table 2). Data quantity is the most cited reason for search engine selection and user habit is the second (Table 3).

- Query Assistance Used by Users

In terms of query input, "spelling suggestion" (suggesting possible words or terms before the user's entry is complete) is regarded as a helpful function for 348 (84%), "search history" (previous searches displayed below the search box) for 276 (67%), "relevant keywords" (the search engine interrogates its database of possible keyword matches related to the keyword query) for 355 (86%), "spelling correction" (the search selecting the best choice among all possible corrections for a misspelled term when users misspell query) for 349 (84%), and "top searches" for 302 (73%). The

needs for query functions are relevant keywords, spelling correction, suggested spelling, top searches, and search history. Each function is needed for over 87% of users (Table 4).

To enter the query, typing description words into the search box is the most commonly used search method. Users value efficiency and accuracy while searching. Accordingly, user interfaces in search engines should focus on speed and accuracy.

Table 1. Search Engine Usage

Search Engine	Participants	Search Engine	Participants	Search Engine	Participants	Search Engine	Participants
YAHOO!	373	Wikiseek	143	AltaVista	3	Lycos	0
Google	356	Baido	51	Snap	2	HotBot	0
YAHOO!	246	Live Search	33	Cuil	2	others	7
ANSWERS		(MSN Search)					

Table 2. Frequently Search Content by Users

Search Contents	report information	everyday knowledge	academic research	commercial products	News	Pictures	Map	Blog	others
Participants	350	303	232	215	196	195	137	126	10

Table 3. Reasons of Use

Reasons	data quantity	user habit	search accuracy	search speed	source of information	function	layout	others
Participants	288	250	246	169	123	75	67	2

Table 4. Query Input Helps Used by Users

Query Helps	relevant keywords	spelling correction	spelling suggestion	top searches	search history
Yes	355	349	348	302	276
Ordinary	44	41	50	94	86
No	16	25	17	19	53

Table 5. Search Result Options Adopted by Users

Search Options	automatically data listing	category selection	instant previews	automatically filter results by type of content	double window	various interface
Yes	348	330	294	282	272	219
Ordinary	58	60	92	105	90	135
No	9	25	30	28	53	61

- Users' Perspectives of Search Engine Result Pages

In terms of search result interface, 330 respondents (80%) regard "category selection" (providing classified search results based on entered search query) as a useful function, 348 (84%) considered "automatic data listing" (search results automatically listed in different types) useful, 219 (53%) identified "various interface" (different queries automatically outputting diverse result pages), 294 (71%), identified "instant previews" (click once on an icon in the search results to instantly see a preview of the Web page), 272 (66%) identified "double window"

(show search results provided by different search engines on the same page), and 282 (68%) identified “automatically filter results by type of content” (search results appear with user habits or queries in accordance to user preferences) as useful. The sequential needs for output functions in search engines are automatic data listing, category selection, instant previews, automatically filter results by type of content, double window, and layout settings. Each function was cited as needed for over 85% of users (Table 5).

Of Web search engine usage and statistics among the 415 participants, the preference ranking for search engine entrances is Yahoo!, Google, and MSN Search, in that order. User habits mostly account for preference factors up to 272 responses (over 66%). Of the current search engine displays, 322 respondents (78%) do not consider the current displays the best, while 93 regard them as the optimal; over 90% (409 users) think that search engine interfaces could be more various and changed. Accordingly, the most common listing style for search result displays does not fully meet user needs.

- Use Satisfaction of Current Search Interfaces

For 415 search engine users, the first three representative Web2.0 Websites are YouTube, Wikipedia, and Facebook (Table 6). WRETCH (www.wretch.com) scores the highest usage rate (45%) for users who once set up blogs on Websites, and, yet, every user uses blogs (Table 7). For blog related functions, 346 respondents (83%) regard “personal management” as a helpful function, 375 (90%) identified “interface layout settings,” 388 (93%) identified “edit/share/delete/revise,” 382 (92%) identified “reply/leave a message,” and for 297 (72%) cited “tool options.” Blog-related function needs are edit/share/delete/revise, reply/leave a message, interface layout settings, personal management, and tool options, in that order. Each function is identified as needed for over 90% of users (Table 8).

Of the needs for Web-related functions for 415 users, Instant Messenger (e.g. MSN, Skype, Google Talk, Yahoo Messenger) functions that provide users with instant share and responses are regarded as useful for 407 respondents (98%), while 8 do not consider them so; 380 (91%) respondents regard Wikipedia functions that allow every user to edit and revise Website information as helpful for the accuracy of information and knowledge while 35 (9%) do not.

Based on the survey statistics, most search engine users use various and characteristic Websites such as YouTube and Wikipedia. These Websites feature interactive sharing and score in the top two for use experience; moreover, the usage rate of blogs as a Web2.0 feature counts for up to 92%. The user need for personalised management functions is over 90%.

- Specific needs of Internet users

For specific needs of Internet users among 415 respondents, 310 (75%) regard “delete/revise search results” as a useful function, 273 (66%) identified “result display by hits ranking,” 348 (84%) cited “personalised search results,” and 353 (85%) users reported “share/integrate search results” are useful. Sequentially, the specific needs of Internet users are share/integrate search results, personalised search results, delete/revise search results, and result display by hits ranking (Table 9). Each function is needed for over 90% of users. Moreover, over 90% (384 respondents) think that it is helpful for users to be able to simultaneously select different search engines.

Table 6. Web2.0 Websites of Use

Web2.0 Websites	Participants	Search Engine	Participants	Search Engine	Participants	Search Engine	Participants
YouTube	391	Flickr	115	funP	29	Digg	12
Wikipedia	373	Amazon	94	Twitter	24	HEMiDEMi	10
Facebook	154	Plurk	72	MyShare	23	Del.icio.us	8

Table 7. Blogs Usage

Blogs	Participants	Blogs	Participants	Blogs	Participants	Blogs	Participants
WRETCH	318	blogger	56	PChome	21	others	18
MSN	68	Xuite	49	Sina	7	No	59
Yahoo!Blog	64	YAM	48				

Table 8. SE Users' Favourite Blog Features

Query Helps	edit/share/delete/revise	reply/leave a message	interface layout settings	personal management	tool options
Yes	388	382	375	346	297
Ordinary	24	31	35	63	90
No	3	2	5	6	28

Table 9. Specific needs of Internet users

Specific Needs	share/integrate search results	personalised search results	delete/revise search results	result display by hits ranking
Yes	353	348	310	273
Ordinary	51	58	89	99
No	11	9	16	43

3 A Personalised and Web2.0-Based Search Engine Interface

Through an examination of current search engine interfaces, including query input, search box, search results pages, and search engine options and features, a variety of small tools and features, according to habitual practices, preferences adoptions, user habits, and acceptance in the Web2.0 trends, have an impact on search engine interface needs with increasing expectations and preferences. A variety of Web2.0 related applications and services that serve diverse use experiences also affect use habits and preferences for current users who expect more personalised services.

Because of keyword usage, query input has been the most deep-rooted concept and thus a habit for users. Therefore, providing appropriate query assistance, such as relevant keywords, spelling correction, spelling suggestion, top searches, and search history, is also demonstrated in the study.

Based on an investigation of user needs and preferences for the usage of search engine interfaces, this study proposes several suggestions below with which search engines should be equipped:

- Mashup and Tagging

Data displays, which over 90% of the respondents consider helpful, should be able to simultaneously select different search engines; moreover, in terms of query input and search result output, search engine functions highly appeal to user requirement

and acceptance, and users expect more personalisation- and interaction-related functions of search engine interfaces in the current Web2.0 trends. With respect to the current developing trends of search engines, there are hundreds of assorted search engines on the Internet, but they are independently developed and scattered. Despite their various functions and features, these search engines have a hard time against Yahoo! and Google among users. Accordingly, these currently scattered search engines should be integrated so that search engine interfaces will better meet user needs and provide more suitable and personalised user interfaces.

For example, shown as

Fig. 1, a personalised and Web2.0-based search engine interface will take account of user needs and preferences and present itself in an integrated way with the community concept to involve users. For the query input part, search results output displays, personal settings, and search results, search engine interfaces offer users personalised search methods and results that will improve more convenient search procedures to meet personal needs.

- Creating Users' Personalised Search Engine Interface

Personalised services of a user-centred approach and the integration of interaction and sharing have become current trends. Thus, search engine interfaces that impact user selection should integrate a variety of Web2.0 features to cater to the behaviour patterns of current users. User habits have become an important factor for search engine users. In short, search engine outputs should be generated based on the personal needs of each individual. Search engines should automatically record users' habitual practices and behaviour patterns. There should also be various result displays based on different questions so that interfaces are more diverse to meet user needs.

For example, as shown as

Fig. 1, there are four types of search results on the original display interface of search engines: general search engine, information sharing, video, and image. Each type offers several logos of different search engines in the upper right corner of the window. These search engines are of the highest usage rate or are currently the most representative. Hence, while users search the keyword "Clownfish" in the search engine interface, the search results of different search engines will simultaneously be presented, including various search results such as text, as with Google, knowledge, as with Wikipedia, video, as with YouTube, and image, as with Flickr. Users may feel free to click on the small icons of other search engines in the upper right corner to review search results provided by different search engines or in the drop-down arrow to select more search engines. Moreover, search engines record preferences and habits of every user automatically in addition to the types of the most-used search engines. Furthermore, users may re-arrange the windows in the search results display at will and may adjust the size, select zoom-in or zoom-out, and close or add a new window by clicking on the upper right icon according to personal preferences. Each user may acquire a personalised search engine interface.

Thus, search engines should offer users personalised interfaces with layout settings (e.g., colour, position) and tool options and offer a variety of personalised management options in accordance with behaviour patterns of Website usage (e.g., blog) in the current Web2.0 trends to increase the efficiency and selectivity while users use search engine interfaces.

- **Social Aspects:** User Contribution, Recommendation and Search results sharing with others

Search engines should allow edition, revision, and deletion of result rankings and reply to result content. Search engines should also display results by hit ranking so that the suitability and accuracy of information rankings are filtered by users collectively, and integrated search results are accordingly presented to increase the preciseness of information and knowledge to best meet search results. By the integration and sharing of personalised search results of search engine users from different fields, perhaps with online instant sharing, feedback, etc., the community power contribution of users in these Web2.0 trends will shorten the time spent on data clicking and help users acquire optimal search results.

For example, as shown as

Fig. 1, after users search the keyword “Clownfish,” they may click on the right icons of each search result to edit images, make a deletion, or post a comment. Users may re-arrange the order of search results as they desire and read other users’ comments on the search result. Accordingly, users may acquire personalised search results regarding the term “Clownfish.” Users may click on the left icons of search results to show approval. Moreover, every user may share edited search results with other users as a reference. Users of different fields thus share information and acquire more complete, accurate, and diverse search results.

Users are considered integral in interface designs. In order to develop a new user-centred interface design for search engines, this study identifies issues of search engine interface designs through a literature review, and a questionnaire survey



Fig. 1. A Personalised Search Engine Interface: A New Search Engine Paradigm

examines user habits and needs for search engine interfaces and user views and preference for search engine interface functions in the current Web2.0 trends to generalise design-related references for a new search engine interface.

This study proposes a personalised and Web2.0-based search engine interface to meet every user's needs when accessing a search engine. The new search engine interface provides general functions like Google and other unique functions and interface designs such as various input/output interfaces, personalised layout settings, search result sharing, knowledge sharing, integrated type of functions, and interfaces.

Every user may edit and arrange result data to cater more to general needs. The interface offers assistance and options on keyword input and integrates the search results of every search result so that users may simultaneously acquire diverse search results and select commonly used search engine based on personal habits to meet user needs in accordance with Web2.0 trends. Every user has a personalised search engine interface and may set layout, language, and function icons based on habitual practices and preferences that allow more convenience while using the search engine interface. Overall, the new search engine interface provides users with an integrated interface and related services and aims to improve the convenience and efficiency of procedures as users use search engines in the current Web2.0 trends.

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References

1. Wiza, W., Walczak, K., Cellary, W.: Periscope: a system for adaptive 3D visualization of search results. In: Proceedings of the Ninth International Conference on 3D Web Technology. ACM, Monterey (2004)
2. Jansen, B.J., Spink, A.: How are we searching the World Wide Web? A comparison of nine search engine transaction logs. *Information Processing & Management* 42(1), 248–263 (2006)
3. Yang, H.-C., Tzeng, M.-C., Yang, C.-Z.: A Web Interface for Visualizing Web Search Engine Results (2002)
4. Google. Google (1998), <http://www.google.com.tw/> (cited January 24, 2011)
5. StatCounter, StatCounter Global Stats Top 5 Search Engine, StatCounter (2010)
6. YAHOO! YAHOO! (1994), <http://search.yahoo.com/> (cited January 24, 2011)
7. Bing. Bing (2009), <http://www.bing.com/> (cited January 24, 2011)
8. FundooWeb. FundooWeb (2006), <http://fundooweb.com/> (cited January 24, 2011)
9. KartOO. KartOO (2001), <http://www.kartoo.com/> (cited January 24, 2011)
10. Omgili. Omgili (2006), <http://omgili.com/> (cited January 24, 2011)
11. O'Reilly, T.: Web 2.0 Compact Definition: Trying Again. O'Reilly Radar, Sebastopol (2006)
12. Deshpande, A., Jadad, A.R.: Web 2.0: Could it help move the health system into the 21st century? *The Journal of Men's Health & Gender* 3(4), 332–336 (2006)
13. Needleman, M.: Web 2.0/Lib 2.0—What Is It? (If It's Anything at All). *Serials Review* 33(3), 202–203 (2007)
14. Mason, R., Rennie, F.: Using Web 2.0 for learning in the community. *The Internet and Higher Education* 10(3), 196–203 (2007)

15. Stephens, M., Collins, M.: Web 2.0, Library 2.0, and the Hyperlinked Library. *Serials Review*, 33(4), 253–256 (2007)
16. Hendler, J., Golbeck, J.: Metcalfe's law, Web 2.0, and the Semantic Web. *Web Semantics: Science, Services and Agents on the World Wide Web* 6(1), 14–20 (2008)
17. Boulos, M.N.K., Wheeler, S.: The emerging Web2.0 social software: an enabling suite of sociable technologies in health and health care education. *Health Information & Libraries Journal* 24(1), 2–23 (2007)
18. Chau, M., Wong, C.H.: Designing the user interface and functions of a search engine development tool. *Decision Support Systems* 48(2), 369–382 (2010)
19. Huang, S.-T., Tsai, T.-H., Chang, H.-T.: The UI issues for the search engine. In: *Proceedings of 11th IEEE International Conferences on Computer-Aided Design and Computer Graphics*, Yellow Mountain City, China (2009)
20. PEW/INTERNET, Search Engine Use (2008)