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Surfrom: a Community-Oriented Search Engine Interface

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Abstract: Search engine interfaces are an important connection between user and Internet information and also the intermediary with which users most frequently interact. The mainstream Web 2.0, with its participatory nature, allows users to play an active role in contributing, creating contents, and sharing information all through user interfaces. Our proposed Surfrom system is a Meta search engine interface that meets user preferences and shares knowledge of edited search results in the current Web 2.0 trends. Surfrom is designed and developed with the community concept and is also user-centered, as the core of its design is to provide every Surfrom searcher with integrated search results and various search engine functions. Following the findings or Surfrom validation, users state that personalized search engine interfaces are helpful to acquire and collect information in searching. With integrated search results and the concept of interaction and sharing, the process convenience of using search engines is also increased. The willingness to use the Surfrom search engine is high.

Keywords: Search engine, User interface design, Web2.0

1. Introduction

With the increasing global penetration of the Internet, coupled with the accumulation of many varieties of information over time, search engines have become the agents that manage and organize this enormous store of online knowledge. They have also become one of the most important and frequently used services, heavily influencing the way users perceive the Internet [1]. Since Google began in 1996 [2], it has been the most popular search engine and has maintained its place at the top of the worldwide usage rate of all search engines. According to a SEO Internet Marketing survey [3], Google's usage rate reached 60.94% to 74.04% of all usage rates during the period from 2006 to 2010. From 1 July 08 to 12 Dec 10, Google's usage rate rose to more than 90% and remained at number one according to a survey by StatCounter GlobalStats [4]. For most users, therefore, Google represents all search engines. Correspondingly, the 'Google-like' user interface (UI), presenting search results in a listing manner, has continued to influence search engine UIs and content display, such as Yahoo [5], Bing [6].

The famous term 'Web 2.0' is closely associated with Tim O'Reilly [7], and it involves wikis, blogs, social networking technologies, web applications, mashups, and folksonomies, and others. The Web 2.0's services and applications are characterized as being powered by the community and user experiences, including participatory information sharing, interoperability, user-centered design, and user interaction and collaboration on the World Wide Web [8–11]. In response to Web 2.0's related functions and technical development, search engines have been upgraded to include various new features. For instance, as opposed to a text-based list of search results, KartOO [12] displayed a visual interface and provided graphical search results. Technorati [13] was a blog-search Internet search engine. Snap [14] provided Web 2.0 tools, including Snap Shots, Snap Shares, and Snap Shots Engage, to allow users to preview the information about the sites by placing the cursor over the name of the site in the list generated by their

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search. Wikiseek [15] was launched as a Wikipedia search engine, indexing Wikipedia pages and Wikipedia articles. Cuil [16] applied the clustering ideas on the Web to create encyclopedia-like reports; for example, many relatively long entries along with thumbnails pictures are displayed on search result pages. Omgili [17] is a forum search engine that is used for searching user-generated content platforms, such as forums, discussion groups, message boards, and the like. That is to say, these Web 2.0 search engines offer users interfaces with a great diversity of features and applications that can be integrated with difference sources [18]. Furthermore, search engine users are no longer required to play a passive role in viewing content that was created for them; a Web 2.0 site allows users to interact and collaborate with other users to become creators of user-generated content in a visual platform [19,20]. It is clear that Web 2.0 technologies and concepts offer a qualitatively different Web experience than the previous Web1.0 design produced, and they have in fact created a new version of the World Wide Web [7,21,22]. However, to this date, these Web 2.0 search engines have reached a worldwide usage rate of only 1% [4].

Tim Bernes-Lee asserts that the Web should be 'a collaborative medium', 'a creative medium' and a 'Read/Write Web' [21,22]. That is, the Web is a platform for its users; user-centered UI is thus the core of search engines when they are in operation. Furthermore, user experience and preferences in search engine UIs deserve attention if one is to keep up with the prevalence of Web 2.0 and remain accommodating to user requirements. Whether one looks at Web UI guidelines that emphasize the importance of user-centered design or at other search engine UIs that attempt to cater to the prevalence of Web 2.0, it seems clear that little attention is being paid to the user habits and preferences that exist among these search engine users. In order to explore the pattern of user behavior on today's Web 2.0 sites and communities and then integrate these findings into relevant search engine services and UIs, we conducted a survey to examine the relationship between user behavior and requirements when interacting with search engines, as well as the impact of Web 2.0 trends on users. We also attempted to identify influential factors for search engine UI design based on our research findings [23]. 415 participants aged 18 to 29 were interviewed via this questionnaire survey. Through an examination of search engine usage among the younger generations, query assistance used by users, users' perspectives of search engine result pages, user satisfaction with current search engine UIs, and specific needs of Internet users, it was found that Web 2.0 has significant influence on user habitual practices and expectations and also impacts on search engine UI design. This study proposed three suggestions for search engine UI design. The first is (a) mashup and tagging. A search engine UI should be capable of allowing users to integrate those currently scattered search engines and thus provide personalized search procedures and services. A second suggestion is (b) creating users' personalized UI layout. A search engine UI offers users personalized interfaces with a variety of layout settings and management options in accordance with behaviour patterns of Website usage (e.g., blogs) to increase efficiency and selectivity for users using search engine UIs. A third suggestion involves (c) social aspects: sharing user contributions, recommendations and search results with others. Search engines should allow editing, revision, and deletion of result rankings and the ability to reply to result content. In addition, users are able to share edited search results with other users as a reference [23].

Search engine interfaces are an important connection between user and Internet information and also the intermediary with which users most frequently interact. The mainstream Web 2.0, with its participatory nature, allows users to play an active role in contributing, creating contents, and sharing information all through user interfaces (UIs). With the purpose of providing search engine users an appropriate UI, this study employs the above design factors based on the literature reviews and survey findings to design and develop a new search engine interface in accordance with the prevalence of Web 2.0 technologies and concepts.

2. Design Conecpt and Interface Design

The study presents an innovative design for web search engines, Surfrom, following the above UI design suggestions. This study is an interdisciplinary project, combining multimedia design and information engineering fields, which aims to provide a new search engine experience more closely associated with the user requirements and characteristics of Web 2.0.

2.1. The functions and system architecture of Surfrom

Surfrom is a user-centered and community-based platform associated with Web 2.0 technologies and concepts. The system functions of Surfrom consists of several parts: Meta search, mashup technique, personal profiling, search result editing, and search result sharing, as illustrated in figure 1. Surfrom provides users with assistance in the form of spelling tips, input history, related searches and search classification. Every Surfrom user must log in with a personal account and password to assure user privacy when interacting with Surfrom; the system allows users to set up a personalized and preferred layout; on the search result pages, Surfrom empowers users to edit search results. That is, users are allowed to hide or delete search results, move and promote some results to the top of page, add an option to comment on a search result, and read other users' edits. In addition, an experimental feature of knowledge sharing is employed in the section of search area and search knowledge. Surfrom users are able to create their lists of annotated search results and share them with other

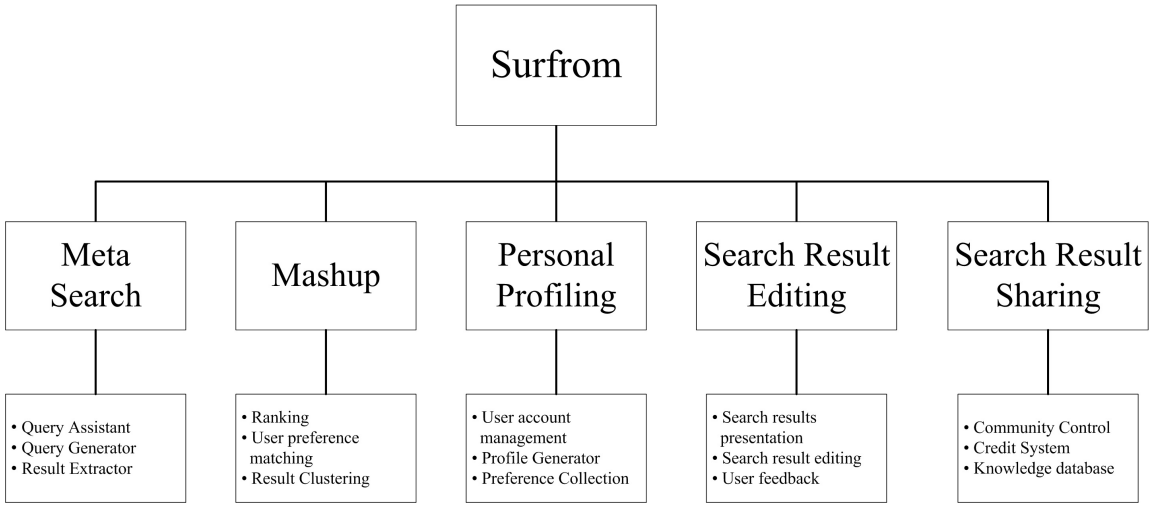

Figure 1 The functions chart of Surfrom system.

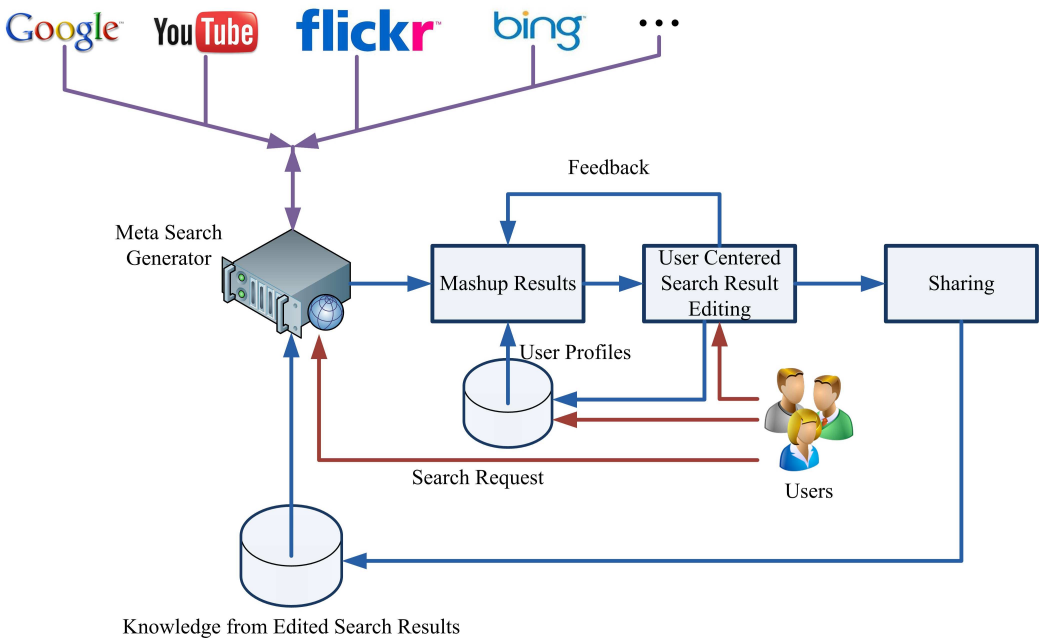

Figure 2 The system architecture of Surfrom.

Surfrom searchers; accordingly, users are allowed to view other Surfrom members' personalized lists of search results. This function of knowledge sharing among Surfrom community members offers users increased control over their search results and is expected to provide them more accurate and consultative assistance and a better user experience.

Figure 2 shows the system architecture for Surfrom platform. After logging in and beginning a search, two types of search results are gathered and mashuped for Surfrom

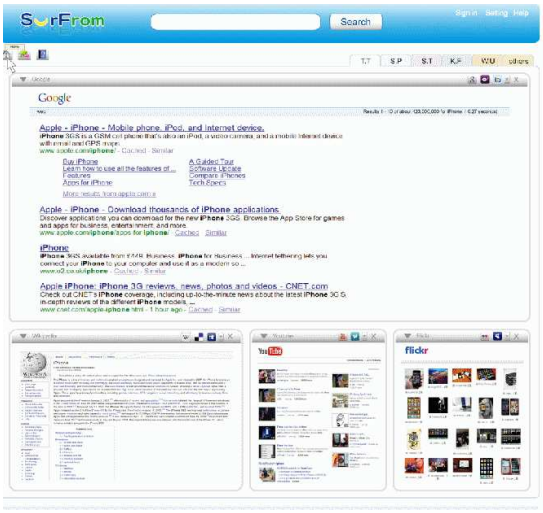

Figure 3 The Surfrom Home Page.

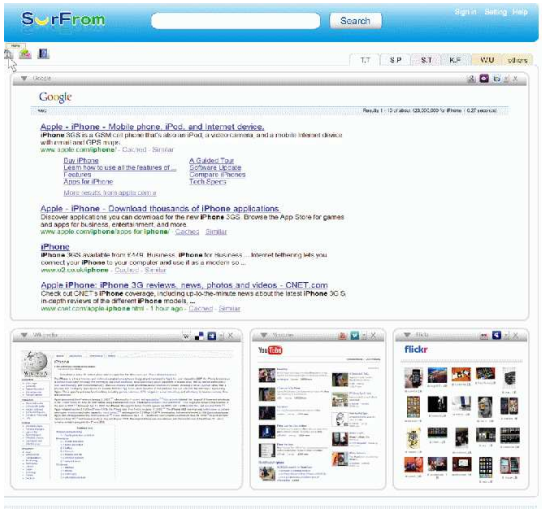

Figure 4 The screen down of search results edited in the best way and shared on the Surfrom platform by the Surfrom community participants from different fields.

searchers. One involves the Meta search engines, including Google, YouTube, Bing, Flickr, and others like that; the other one is the knowledge-based search results that have created and shared by other Surfrom members. Surfrom integrates search results of every search engine, and re-rank the results according to user profiles for more diverse and accurate search results. Surfrom users can help by reviewing and adjusting the search result rankings to improve the accuracy of the search results. They can also leave comments or add URLs to the search results to generate better results for the input query. It can also be shared as useful search results knowledge to other users.

2.2. Surfrom UI design

This study employed three UI suggestions for the design concept and guidance for the design and development of Surfrom. The relevant components of Surfrom UI design, which involved 'Mashup and Tagging', 'Creating Users' Personalized UI Layout', and 'Social Aspects', are detailed in the following paragraphs.

2.2.1. Mashup and Tagging

Surfrom is a community-oriented search engine. Hence, data from each search result that users edit and arrange will be shown on the Surfrom home page. These users are participants of the Surfrom community, and the edited and arranged search results are displayed on the home page but are constantly being changed according to popularity of items. As shown in figure 3, once users have signed in to the Surfrom home page, search results of Surfrom memebers or those from popular edits are presented in the upper right corner. For example, User T.T edited, arranged, and shared search results of the "iPhone" entry on Surfrom so that other users could review or use it as a reference once they entered the Surfrom home page. If one clicks on another user, S.P, the search results for the "coffee art" entry that have been edited and arranged by S.P will also be shown. Each of the search results is edited in the best way and shared on the Surfrom platform by the Surfrom community participants from different fields (Figure 4). All Surfrom users may not only edit personalized search results but also review and use them as a reference for the search results of other users. Accordingly, once Surfrom users share the optimal personalized search results, every user has an opportunity to become a part of the popular searches on the Surfrom home page. Surfrom provides users with integrated interfaces and functions in query input, search result output, personal settings, and other areas of interest. For the input part, there are functions such as hint, memory, related search, and search classification that save search time and provide greater accuracy and efficiency. Additionally, there are diverse results displayed in output such as different types of search results (text, knowledge, video, and image) and various options for selecting search engines. Users may adjust the window layout or set other preferences in personal settings; in addition, there are small tools such as preview (Figure 7) that facilitate users personalized search methods and results. Moreover, Surfrom records certain types of search engines, search results, and results displays that users may use according to user preferences and habitual practices. Users may edit, delete, and comment on each search re-

sult and share on Surfrom, as illustrated in Figure 5. The results and integrated knowledge that are contributed, filtered, and shared by Surfrom users from different fields provide more suitable results via these interactions and allow more convenient search procedures that meet personal needs.

Figure 5 Personalized lists of search results.

Figure 6 Search results sharing on Surfrom platform.

2.2.2. Creating users' personalized lists of search results

To meet personal needs and preferences and to offer more accurate search results, the Surfrom search engine allows users to move, delete, and add comments on each database of search results. Once users search the query "Clownfish", they may click on the right icons of each search result regarding "Clownfish" to move and/or promote some results

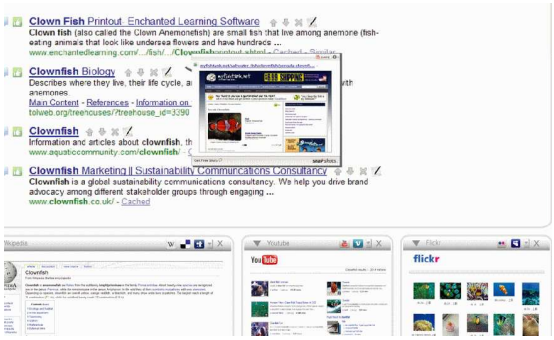

Figure 7 The Search Knowledge on Surfrom.

to the top of page, or they may hide, delete, or add comments. Users may rearrange the order of search results as they desire and also read comments by other users on the search result, which is demonstrated in figure 5. As a result, users may acquire personalized search results regarding the term "Clownfish". In addition, users may click on the left icons of search results to show approval. The icon furthest left of each search result shows the approval number. The search results of the term "Clownfish" are listed in order, according to the number of hits and approvals, to provide Surfrom users with search results that the public considers to be more accurate. Moreover, the design of the Surfrom search engine provides each user with a personalized search engine interface. The original Surfrom default interface appears in neutral gray as do the button or block icons that, after clicking, are differentiated from the non-clicked parts to ensure that users are clear about ongoing functions and actions. Since search engines mainly offer users information, the display of Surfrom search results accounts for most of the interface. The Surfrom layout offers users options regarding background setting, font size, color, additional small icons, and other features that are available as users click on the "Setting" icon in the upper right corner to set related needs. Users may set the layout based on their customary practice and add the small icon of search assistance in the upper left corner if they desire. Users may set personalized interfaces regarding interface displays, background themes, color, and language options. Surfrom also provides users with the options of default layouts or interface related styles according to their personal customary practices and needs. As to window arrangements, moreover, Surfrom users may rearrange the windows of search results display at will according to personal preferences, 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. Each user may acquire a personalized interface of a search engine while using Surfrom.

2.2.3. Social aspects: user contribution, recommendation and search results shared with others

Surfrom users may share their search result edits with other Surfrom searchers. Users may sort other users by field and thus search each personalized database that is edited by users of different professions and interests. As a result, every user could share more accurate and professional search results on Surfrom. For instance, users may edit, delete, or comment on each search result of ”Clownfish” and rearrange the search results by clicking on the right icons for each database section. Users may share the edited page regarding ”Clownfish” via the ”Share” icons on the Surfrom platform. Consequently, while other users search the query ”Clownfish”, they may look directly at the edited search results so that the search time is saved and offering greater accuracy and more options to other users, as illustrated in figure 6. If one searches the ”Clownfish” query, the edited search results by other users, such as K.T, Q.S, or G.Z, are thus presented. The display contents of these pages are considered the optimal search results by all Surfrom users. Users may also add more approvals by clicking on the upper right corner of the page. In addition, there are shown field classifications and the number of users who have edited the data at the top of the window. Users may click on these files and review the edited search results of others. The Surfrom users of different fields thus share information and acquire more complete, accurate, and diverse search results. Besides sharing more diverse search results, the Surfrom users may encounter the same questions while searching the same information. Hence, Surfrom integrates and classifies questions and related solutions. When users search specific information, they may instantly acquire related knowledge and solutions that are edited by all the users of Surfrom, as shown in figure 7. Users who are searching ”Clownfish” may click on the ”Search Knowledge” icon at the top and a new window will appear above on the Surfrom interface showing the contents of related knowledge regarding ”Clownfish,” such as feeding, purchasing, and other information. The knowledge comes from the related questions and specific solutions proposed by all the Surfrom users. Users may search fish types, question types, question raised time, and many other items. By sharing of integrated knowledge and using the rating system, users may save time searching the same questions and acquire the best answers more rapidly.

This study adopted the three design suggestions as design references for the new search engine UI and designed a new Surfrom search engine platform. Surfrom provides not only general functions like Google’s, such as use assistance on interface input or edit/delete/comment capabilities on search results but also offers other unique functions and interface designs such as various input/output interfaces, personalized layout settings, search result sharing, knowledge sharing, and integrated types of functions and interfaces. Surfrom is designed and developed with the community concept at its core. Surfrom integrates the search results, questions, and solutions of every Surfrom user and shares personalized information via Search Area and Search Knowledge. Every Surfrom user may edit and arrange all the resulting data that will cater more to general needs. Surfrom also filters search results through the rating system to provide every Surfrom user with more diverse and efficient search procedures. The Surfrom interface offers assistance and options on query input and also integrates the search results of every search result so that users may simultaneously acquire diverse search results and select the commonly used search engine based on user habits. Surfrom presents optimal search results according to information types, and it offers personalized search results; moreover, Surfrom fully meets the users’ needs in the Web 2.0 trends. Every Surfrom user has a personalized search engine interface and may set the layout, language, and function icons based on habits and preferences, which allows greater convenience while using the Surfrom search engine interface. All in all, Surfrom provides users with an integrated type of search engine user interface and related services and aims to improve the convenience and efficiency of procedures as greater numbers of users begin to use search engines in the current Web 2.0 trends.

3. Surfrom Validation

To validate the user acceptance and functionality of the new Surfrom search engine platform, the evaluation consisted of an experiment of Surfrom functions and an interview for evaluating user perspectives. Forty-six participants aged 18 to 29, 28 males and 18 females, having more than 5 years of experience in using search engines were selected in the validation survey. In terms of frequency of use and selection for search engines, Yahoo! and Google reached the highest usage rate-up to more than 67% for the option of ’Ever used’ and ’Commonly used’ search engines. Forty-four participants indicated that ’Everyday’ use of search engines constitutes their customary online activities.

Prior to the experiment, the participants were required to fill in the basic information and answer questions associated with search engine selection and use. The process of Surfrom validation lasted 30 minutes, including the actual operation and interview. Furthermore, to ensure the reliability and equality of experiments, each participant was given the search queries selected by the system, and interviews were conducted to obtain users’ perspectives after the Surfrom operation. Based on the results of the Surfrom evaluation, user-friendly interface design, personalized search results, and community sharing are discussed in this study.

3.1. User-friendly interface design

Forty-four participants indicated that ’helps with query input to text box’ (e.g., query suggestions, related queries,

query classification, and top current searches) were useful tools to accelerate query procedures and facilitate the loading and manipulation of data. In terms of user customary practices, Surfrom purposed a mashup of different types of web search tools, as shown in figure 3, which allow users to decide and select the search engines they actually prefer most. Forty-three participants considered the search engine mashup to be a simple and useful tool for integrating information and services simultaneously in an interface.

3.2. Personalized search results

Surfrom is a search-engine mashup that empowers Surfrom users to create their own Google-Wikipedia-YouTube-Flickr mashup in a clean and fast interface. That is, the Surfrom platform displays one query box and search results from Google, Wikipedia, YouTube, and others in side-by-side frames. It should be noted that Surfrom empowers searchers to filter and customize the search results; that is, this edit-results feature, where Surfrom members are enabled to move up results, hide or remove search results, add Like or Don't Like and related comments, and view customer reviews of search results, seems to correspond better with the concepts of personalization and participatory information sharing. All of the participants agreed that the search engine mashups enhance the personalization, improve the search process, and acquire varied types of results; moreover, the features of a personalized search provide an efficient way to gather information and to enhance their user experience.

3.3. Knowledge sharing and collaboration

In addition to the feature of personalized results, the section of Search Results Sharing on the Surfrom platform encourages users to share their own list of annotated results with other Surfrom searchers. Forty-four of all participants indicated that the personalized edited list shared by the owners from different professional fields generate more accurate results lists and make online information updating simpler for those who are uncertain and indecisive. While linking search engines and the culture of participation, Surfrom is not only a search engine mashup but also a social platform. Surfrom members can raise questions and obtain assistance from the source file or from other Surfrom members.

4. Conclusions

Our proposed Surfrom is a Meta search engine interface that meets user preferences and shares knowledge of edited search results in the current Web 2.0 trends. Surfrom is designed and developed with the community and user-centered concept, as the core of its design is to provide every Surfrom platform user with integrated search results and various search engine functions. Surfrom offers a user more options and greater assistance on query input. For search results output, a user may acquire personalized search engine interfaces and search results according to personal preferences. Through the interaction and sharing with others on the Surfrom platform, users may also acquire more diverse and various search results and information. Since every Surfrom user may set a personalized search engine interface, it thus becomes a rather convenient and simple operation. The convenience of the search process is also increased. In general, Surfrom meets every user's needs in using search engine interfaces. Surfrom also takes user habits into account. Users state that personalized search engine interfaces are helpful to acquire and collect information in searching. With integrated search results and the concept of interaction and sharing, the process convenience of using search engines is also increased. The willingness to use the Surfrom search engine is high.

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References

[1] Jansen, B.J. and A. Spink, How are we searching the World Wide Web? A comparison of nine search engine transaction logs. Information Processing & Management, 2006. 42(1): p. 248-263.
[2] Google. 1996 [cited 2011 Aug 8]; Available from: `http://www.google.com.tw/`.
[3] SEO Consultants Directory. Top Ten Search Engines - Top 10 SEs. 2010 2010-09-08 [cited 2011 Aug 8]; Available from: `http://www.seoconsultants.com/search-engines/`.
[4] StatCounter. StatCounter Global Stats Top 5 Search Engine from 1 July 08 to 12 Dec 10. 2011 [cited 2011 Aug 8]; Available from: `http://gs.statcounter.com/#search_engine-ww-daily-20080701-20101212`.
[5] YAHOO! 2011 [cited 2011 Aug 8]; Available from: `http://search.yahoo.com/`.
[6] Microsoft. 2011 [cited 2011 Aug 8]; Available from: `http://www.bing.com/`.
[7] O'Reilly, T. What Is Web 2.0. 2005 2011-Aug-8; Available from: `http://oreilly.com/web2/archive/what-is-web-20.html`.
[8] Boulos, M., I. Maramba, and S. Wheeler, Wikis, blogs and podcasts: a new generation of Web-based tools for virtual collaborative clinical practice and education. BMC Medical Education, 2006. 6(41).
[9] Deshpande, A. and A. Jadad, Web 2.0: Could it help move the health system into the 21st century? The Journal of Men's Health & Gender, 2006. 3(4): p. 332-336.

[10] Needleman, M., Web 2.0/Lib 2.0–What Is It? (If It's Anything at All). Serials Review, 2007. 33(3): p. 202–203.
[11] Wikipedia. Web 2.0. 2011 2011-August-8 [cited 2011 Aug 8]; Available from: http://en.wikipedia.org/wiki/Web2.0.
[12] KartOO. 2001 [cited 2011 Aug 8]; Available from: http://www.kartoo.com/.
[13] Technorati. 2002 [cited 2011 Aug 8]; Available from: http://technorati.com/.
[14] snap. 2006 [cited 2011 Aug 8]; Available from: http://www.snap.com/.
[15] Wikiseek. 2007 [cited 2011 Aug 8]; Available from: http://www.wikiseek.com/.
[16] Cuil. 2008 [cited 2010 September 17]; Available from: http://www.cuil.com/.
[17] Omgili (Oh My God I Love It). 2010 2010-June-23 [cited 2011 Aug 8]; Available from: http://omgili.com/.
[18] Mason, R. and F. Rennie, Using Web 2.0 for learning in the community. The Internet and Higher Education, 2007. 10(3): p. 196–203.
[19] Stephens, M. and M. Collins, Web 2.0, Library 2.0, and the Hyperlinked Library. Serials Review, 2007. 33(4): p. 253–256.
[20] Hendler, J. and J. Golbeck, Metcalfe's law, Web 2.0, and the Semantic Web. Web Semantics: Science, Services and Agents on the World Wide Web, 2008. 6(1): p. 14–20.
[21] Laningham, S. developerWorks Interviews: Tim Berners-Lee. 2006 [cited 2011 Aug 8]; Available from: http://www.ibm.com/developerworks/podcast/dwi/cm-int082206txt.html.
[22] Lawson, M. Berners-Lee on the read/write web. 2005 [cited 2011 Aug 8]; Available from: http://news.bbc.co.uk/2/hi/technology/4132752.stm.
[23] Tsai, T.-H., H.-T. Chang, and S.-T. Huang, An Investigation into a Personalised and Web2.0-Based Search Engine Interface, in Universal Access in Human-Computer Interaction. Design for All and eInclusion, C. Stephanidis, Editor. 2011, Springer Berlin / Heidelberg. p. 420–429.

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