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A multi-source book review system for reducing information overload and accommodating individual styles

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Abstract

Purpose – The purpose of this paper is to evaluate the performance of the multi-source book review system (MBRS). MBRS was designed to reduce information overload using the internet and to accommodate different learner preferences.

Design/methodology/approach – The authors experimentally compared MBRS with the Google search engine. MBRS first gathers reviews from online sources, such as bookstores and blogs. It reduces information overload through an advanced filtering and sorting algorithm and by providing a uniform user interface. MBRS accommodates different learning styles through various sort options and through adding video-mediated reviews.

Findings – Results indicate that, compared with Google, MBRS: reduces the information overload associated with searching for online book reviews; increases users finding satisfactory book reviews; and allows users to find reviews more quickly. In addition, more than half of the participants found video-mediated book reviews more appealing than traditional text-based reviews.

Research limitations/implications – Future studies might examine the effects of other recommendations or sorting methods to fit individual preferences in a more dynamic way.

Practical implications – This study assisted readers with a preference for visual information in locating reviews of personal interest in less time and with finding reviews more aligned with their individual learning preferences.

Originality/value – This study documents an innovative web site featuring video-mediated book reviews and other mechanisms to accommodate individual preferences. Search engine designers could integrate book reviews with different media types to reduce cognitive load allowing readers to focus attention on the reading task. Internet booksellers or library staff may use this as an effective means to enhance reading motivation.

Keywords Digital libraries, Reading, Multi-media, User interfaces, Electronic books, Search engine

Paper type Research paper

1. Introduction

People search for information for personal or work purposes, but also in order to learn (Kao *et al.*, 2008; Puustinen and Rouet, 2009). Book reviews remain indispensable tools for such searches, providing information to the general public, academics, schools and libraries which assists them in making better book purchase decisions (Lin *et al.*, 2007).

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The trend of increased use of technology in education (So *et al.*, 2009) is also transforming how readers look for information about books. Whereas in the past there was greater reliance on the opinions of friends or relatives or perhaps a small number of newspapers and magazines, the internet now offers access to thousands of online book reviews. If usable information was often too scarce in the past, the problem now is one of potential information overload (Papanikolaou *et al.*, 2002), with both students and teachers having increasing difficulty keeping up with the expanding online knowledge base (Hess, 1999).

In addition to the sheer quantity of available information, a further problem is that the desired information is not always conveniently located. There is no single search tool or web site that aggregates book reviews from different sources. Thus, despite the growth in the overall number of online book reviews, potential readers may well find it difficult to locate book reviews relevant to their particular needs. For example, Taiwan's largest online bookstore, books.com.tw, collects few book reviews. Amazon.com offers a large number of reviews for bestsellers but few or none for less popular books. Personal blogs often provide reviews for books regardless of their popularity, but locating these reviews often requires considerable effort. In the absence of any convenient central location, most readers are forced to resort to search engines.

Readers who use search engines to locate book reviews are faced with a massive problem of information overload, which can easily overwhelm their cognitive capacity (Chen *et al.*, 2009). This problem has three primary causes. First, search engine algorithms do not adequately filter out irrelevant hits, such as advertisements. Second, although search engines do have methods for sorting results, they are not specifically designed to distinguish between different reviews based on their qualities or characteristics. Finally, the information presented in different book reviews is typically organized in very different ways, forcing the reader to adapt to a new information structure for each review. Thus, for example, a potential reader who searches Google for a book review of *The DaVinci Code* will be confronted with nearly 2.5 million hits. Many of these will not be reviews at all, and those that are reviews will vary widely in terms of both quality and organization.

This paper introduces an online system to help users locate book reviews called the multi-source book review system (MBRS). The MBRS was designed following careful consideration of problems with existing search engines and an investigation of typical online book review search behaviors, which included a survey asking participants for their opinions and suggestions regarding book review systems. The resulting system was designed to provide a centralized source for book reviews by aggregating reviews from different sites and to reduce or eliminate information overload by focussing on the causes discussed above. The MBRS extracts book reviews solely from online book review sites, and thus does not present the reader with extraneous information. The MBRS also contains a recommendation mechanism which allows users to sort book reviews in terms of quality, thus allowing them to find higher quality reviews more quickly. Further, after aggregating book reviews from different sources, MBRS re-organizes the material presented in each according to a common format, so that readers can quickly locate the information most relevant to their personal needs. The MBRS thus offers the potential of considerably increasing the efficiency of online book review searches and thus of enhancing learning processes.

Felder and Silverman (1988) defined learning style in terms of: the type of information that a student preferentially perceives; the sensory channel through which external information is most effectively perceived; the organization of information

which the student is most comfortable with; the way in which the students prefer to process information; and the way in which the student progresses toward understanding. In their model, learning styles contains four dimensions: active/reflective, sensing/intuiting, visual/verbal, and sequential/global. Active learners tend to understand knowledge through active trial, discussion or by explaining it to others, while reflective learners tend to be more contemplative; "sensing" learners prefer to perceive data by the senses while intuitive learners operate by accessing memories or insights; visual learners prefer information presented in diagrams, pictures or videos while verbal learners desire written words; and, finally, sequential learners gain understanding in logically linear steps while global learners need to grasp the "big picture" before mastering details. The clear assumption is that different learners have diverse ways to learn and process information. The first and second dimensions, dealing with how learners process information (either actively/reflectively or by sensing/intuition), are not directly linked to a system's functionality. The third and fourth dimensions are more closely related to the presentation of content or search results to users. While we believe that our software has the potential to further expand its functionality along the fourth dimension, the most obvious application, and the focus of the present study, is on the third dimension, by offering support to both verbal and visual learners. Thus, whereas traditional book reviews are presented in text, the MBRS was designed to include video book reviews, in an attempt to accommodate learners with more visual learning styles.

The purpose of the present paper is to introduce and evaluate the MBRS. In the next section we will review the literature on these topics and formulate our hypotheses. After that, we will describe the MBRS in detail and then present the results of an experimental comparison of the MBRS with Google. We close with a discussion and with our conclusions.

2. Background

In this section, four issues related to our topic are addressed. First, we will discuss online book reviews and the phenomenon of information overload. Then, we will discuss two features that are central to our system: recommendation mechanisms and video-mediated information.

2.1 Online book reviews

The internet has become one of the most important information sources for many online users (Hsieh-Yee, 2001) and the internet's infrastructure supports the simple, straightforward sharing of information (Celma, 2008; Kao *et al.*, 2008; Raban and Rafaeli, 2007). As a consequence, readers are no longer confined to the role of passive audience members. They are now able to both access and contribute to the product information available online (Chen, 2008). This has, in turn, transformed the book review landscape over the last 15 years (Hoffert, 2010). Blogs and online bookstores are currently the two main sources of online book reviews. Internet bookstore owners often provide space on their web sites where readers, experts and academics can express their views or comment on a particular book (Lin *et al.*, 2007).

Finding a good book can be difficult as most readers attempt to satisfy their own personal "goodness" standards (Adkins and Bossaller, 2007). Readers thus often use online book reviews to search for books that best match their personal needs (Lin *et al.*, 2007). These book reviews may serve a number of functions, including informing readers of the contents of a book or about the author's background, interpreting and

explaining the contents, evaluating the book's aesthetic qualities and likely impact on readers and, of course, potentially motivating readers to choose a particular book (Ryshina-Pankova, 2011). Some access online review sites to determine what book to pick up next, others to decide what to purchase for others to read. Some just want to contribute to ongoing conversations, perhaps merely to see their names online. Some want to learn about the subject, others simply to be entertained or to confirm impressions of a book they have finished.

As noted in the introduction, however, online book reviews are scattered everywhere. Readers often need to spend a lot of time filtering out irrelevant information in order to find a suitable book review. Online bookstores might be thought of as a more centralized site for book reviews, but they do not always provide a sufficiently large number of reviews and their selection of reviews may be influenced by promotional considerations. Further, these platforms do not have cross-platform evaluation mechanisms. Thus, the main purpose in creating the MBRS was to provide a centralized location at which users could access a large number of book reviews.

2.2 Information overload

As the quantity of information on the internet increases, retrieving information of personal interest becomes more difficult. Such large amounts of split-source information may lead to cognitive overload, thus impeding skill acquisition (Chandler and Sweller, 1991). It has been argued that, given the inherent limitations of the human information processing system, after a certain point, increases in information actually lead to a decline in the quality of information processing, with "information overload" occurring when individuals attempt to process and utilize information from too many inputs (Mulder *et al.*, 2006). This phenomenon has also been described in terms of the feeling of stress experienced when available information exceeds processing capacities (Mulder *et al.*, 2006). The problem extends to online information generally (Chen *et al.*, 2009) and to online book reviews in particular (Chen, 2008). Attempting to locate information, users are required to practice and develop advanced search strategies since web searches entail the involvement of complex cognitive processes affected by individual differences (Kao *et al.*, 2008). The complexity of searching for online book reviews may derive either from the presence of irrelevant information in the search results or from the diverse ways in which information is organized on different sites.

According to cognitive load theory, the efficiency of instructional material may influence students' learning engagement (Chandler and Sweller, 1991). Before learning can commence, material must be mentally integrated (Chandler and Sweller, 1991). Integrated learning material reduces the need to reformulate the information to be comprehended; cognitive resources can thus be concentrated on learning. Based on this suggestion, we have developed an integrating system, MBRS, to collect and coherently present dispersed book reviews from all over the internet using a uniform interface. In other words, we used internet-based information retrieval (IR) applications as part of an approach to solving the information overload problem (Ma and Chen, 2003). The goal of IR systems is to identify information that users deem relevant (Ankolekar *et al.*, 2007). Further, the MBRS makes use of regular expressions (an IR tool) to transform the information gathered from various online book reviews into a single, consistent format, thus further reducing cognitive load (Liang and Lai, 2002).

Many researchers (Pass and van Merriënboer, 1993; Mayer, 2005; Mayer and Moreno, 1998; Tabbers *et al.*, 2004; Möller and Müller-Kalthoff, 2000; Seufert *et al.*, 2007; Van Gerven *et al.*, 2004; Brünken *et al.*, 2002; Paas *et al.*, 2003) have developed different

methods to measure cognitive load. Subjective measures use subjective rating scales to assess learner task demands. Objective measures evaluate cognitive load by considering learning outcomes, time-on-task, navigation paths, task complexity, behavioral data, and so on. There is also a combined measure called the efficiency measure (Brünken *et al.*, 2010). In this study, we have adopted a mixed approach, using measures of subjective perceptions and objective performance to assess the extent to which cognitive load can be reduced through use of the MBRS.

2.3 Online recommendations

Research has shown that 57 percent of all internet users search the web each day and searching was reported to be the second most popular online activity, after e-mail use (Hsieh-Yee, 2001). When faced with excessive amounts of information, people may use heuristics, such as recommendations from others, to minimize the effort of decision making (Chen, 2008). Recommendation mechanisms, which were designed with the goal of reducing information overload (Kuo *et al.*, 2009), provide suggestions about items that users might want to purchase or examine and help users navigate through large amounts of information. Recommendation mechanisms are increasingly important tools in light of the expanding use of online data and e-commerce web sites (Burke, 2000). Online reviews written by reviewers with higher reputation and exposure rates are more highly recommended and accepted by users (Hu *et al.*, 2008).

When using a conventional web search engine to obtain information about a book, readers often find it difficult to find precise and relevant information given the sheer quantity of book reviews available from various sources and in different languages on the internet (Kobayashi and Takeda, 2000). An online recommendation mechanism would facilitate making use of both qualitative and quantitative indicators. Quantitative factors such as price and the publication date are usually considered in purchasing a book to read. Structure and format, attributes of content, information orientation, number of words, lexical richness, personal pronouns, and paralinguistic features can be used as good qualitative and quantitative indicators of authentic book reviews (Huang *et al.*, 2012). In Pollach's (2006) research, structure, content, audience appeal, sentence style and word choice were also used as indicators for book reviews. Other indicators, such as the order in which a review appears in search results and the date a review was written, have also been used to represent the quality of book reviews (Hu and Li, 2011). In addition, positive book reviews may increase reader interest in a book if the review content fits their needs (Lin *et al.*, 2005). On the contrary, the number of negative book reviews has also been found to significantly influence the intention to purchase a book (Herr *et al.*, 1991; Lin *et al.*, 2005, 2007).

The MBRS uses some of the above-mentioned indicators (e.g. review content length, the number of recommendations/non-recommendations made by other readers) as well as other novel factors such as the number of associated videos and images, to calculate the quality of book reviews. By incorporating a video book review feature into the recommendation mechanism, MBRS may assist readers with a preference for visual information to locate reviews of personal interest in less time or find reviews more aligned with their individual learning preferences.

2.4 Video-mediated information

Adding interesting pictures to narration may help students better understand the presented learning materials. A widely held cognitive theory assumes that the human information processing system includes dual channels for visual/pictorial and

auditory/verbal processing, with each channel having limited processing capacity. Hence, learning entails a coordination of the dual channels (Mayer, 2005). The theory suggests that when learners build systematic connections between pictures and words, the cognitive load may be reduced, allowing more meaningful learning to occur (Mayer, 2005). Animations and static pictures are two visual representation formats that might reduce cognitive load and benefit learning. Höffler and Leutner (2007) conducted a meta-analysis of 26 primary studies, yielding comparisons of dynamic and static visualizations. They found that highly realistic animations are superior to static pictures in terms of reducing cognitive load.

Video is the medium typically used to display highly realistic animations. In recent years, there has been a trend toward increased use of video in various domains. Videos are also a highly effective learning medium, capable of generating deep levels of understanding (Chandler, 2009), possibly through such characteristics as nonlinearity, association, efficiency and flexibility, all of which can help to decrease cognitive load (Mandilian *et al.*, 2008) and organize information (Hiltz and Turoff, 1985). Readers with large working-memory capacities have been found to be able to handle cognitive load better when using video-mediated information (Lee and Tedder, 2003). Other research has shown that interactive-video computer-based environments are promising tools for helping learners (Overbaugh, 1995) and also an effective means to attract users' attention (Fels and Weiss, 2000). Furthermore, video-mediated information can be seen as a multi-media approach to the presentation of information, which can attract potential users (Sangjae and Kyoung-jae, 2007) and provide powerful and flexible environments for information acquisition (Chandler, 2009). Of course, one remarkable example of video-mediated information is YouTube, where people can upload, view, and share video clips.

In the light of the above, we incorporated an experimental video-mediated book review feature into our proposed MBRS, hoping to raise reader interest in book reviews. Since currently very few book reviews are currently available in video format, we developed our own by selecting books, writing reviews and recording video versions of the reviews using members of our research team. The video reviews were then uploaded to YouTube and, from there, plugged into the MBRS system as one of the review sources. With the feature of integrating self-recorded video book reviews and selected text-based book reviews, MBRS thus attempts to accommodate different learner needs.

3. Research hypotheses

According to our study goals, our hypotheses include:

H1. MBRS users will experience less information overload than users of the Google search engine.

H2. MBRS will be able to find book reviews more suitable to their needs and of a higher quality than will users of the Google search engine.

H3. MBRS users will take less time to find a book review that they feel is satisfactory than will users of the Google search engine.

4. MBRS

4.1 MBRS overview

We have developed a system called the MBRS for gathering book reviews from multiple online sources. MBRS uses a cross-platform recommendation mechanism based on attributes of each book review and readers' opinions (Figure 1). Users log on to MBRS in

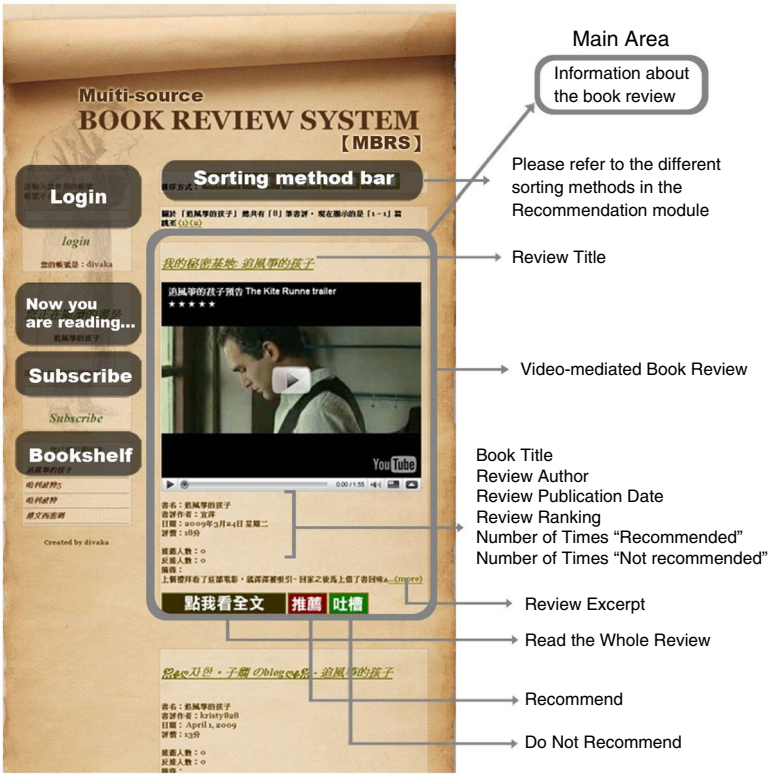

Figure 1.
The MBRS interface

the "login" area and search for the book they want using the "Subscribe" button. Once they have selected and "subscribed" to a particular book, they have access to all of the reviews available for that book. The chosen book appears in the "Bookshelf" box. Readers can switch between different books in the bookshelf area. When a reader clicks on one of the books, the reviews for that book appear in the "Main" area. Readers can use the "Sorting Method" bar to switch between various sorting methods. Only the first 100 words of each review are shown. Users can press the "Read the Whole Review" button to read the full paper. MBRS also provides an immediate feedback mechanism that lets readers choose to either "Recommend" or "Not Recommend" the review.

4.2 MBRS architecture

The MBRS consists of four modules: a crawler, a data-parsing module, a recommendation module, and a data presentation module (Figure 2).

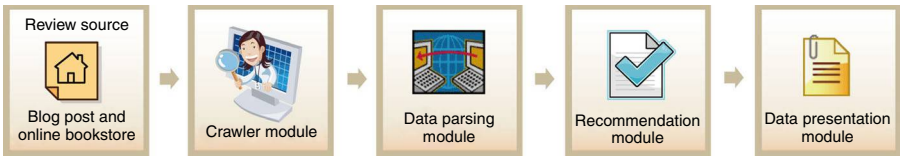

Figure 2.
MBRS sequence diagram

4.2.1 Sources: blog posts and online bookstores. Many readers enjoy sharing their feelings and opinions about books they have just finished by posting book reviews on personal blogs or online bookstores. The MBRS gathers and aggregates book reviews from these sites and delivers the collected information to other MBRS modules. Since our focus is on Chinese-language book reviews, we selected books.com.tw (the biggest Chinese-language online bookstore in Taiwan) as one of our resources. This web site received approximately 2.2 million unrepeated visits in December 2003, 40 percent of which were by students (Lin *et al.*, 2007).

4.2.2 Crawler module. The MBRS uses a web crawler to locate and retrieve reviews from thousands of sources. Web crawlers (also referred to as ants, automatic indexers, bots, spiders and web robots; see Koji and Shigeki, 2001), start with a seed URL and follow links to individual pages (Yadav *et al.*, 2008). They then retrieve raw data and store it for further analysis. The MBRS crawler module searches for and retrieves book reviews from personal blogs and online bookstores and stores the articles in MySQL databases.

4.2.3 Data-parsing module. The data-parsing module uses regular expression techniques to extract information from unstructured raw book reviews. After using the crawler module to locate reviews from dispersed web pages, the data-parsing module distinguishes between different types of text using html tags. After parsing web pages, the module extracts meaningful attributes like "book title" or "reviewer."

The module uses these rules to organize content with different attributes, and then translates reviews using a pre-defined format for database storage. The data parsing module mainly extracts data from raw online book reviews in terms of book title, review publication date, original review web address, writer, content, length, and whether the review contains video. These data are used to filter the information for possible use in the recommendation module.

4.2.4 Recommendation module. To help prevent information overload and to accommodate the different motivations of different communities of readers (Sigurbjörnsson and van Zwol, 2008), we created a recommendation module based on computed scores. The following rules were applied: reviews with more video content and more images are given higher ratings; reviews with greater content length are given higher ratings; reviews with more recommendations are given higher ratings; and reviews with more "Not Recommend" comments are given lower ratings. Total cumulative ratings determined the position of a review relative to all other book reviews.

To calculate rank scores for the book reviews, we use the following attributes and weights:

(1) numbers of videos in the review (five points per video);

(2) numbers of images in the review (one point per image);

(3) the content length of the review (one point for every 100 words);

(4) numbers of positive comments about the review (one point per comment); and

(5) numbers of negative comments about the review (minus one point per negative comment).

4.2.5 Data presentation module. By using information organizing principles, professionals can help provide a coherent and logical structure for basic information units on the web (Lin and Chan, 1999). Using structured information from different

sources determined by the data-parsing module, the recommendation module computes each review's total rating and sorts the results accordingly. The data presentation module then rearranges the content of the reviews into a unified online book review interface. The review format is illustrated in Table I. The top part of the review shows the basic information, such as the review title, writer, and publication date. If the original review contains video, the data presentation module extracts it and puts it under the review title. Review rankings are computed by the recommendation module. Readers can press the "Recommend" or "Do Not Recommend" buttons to express their opinions toward a review and the number of users recommending or not recommending a review is immediately updated.

5. Experiment

5.1 Study design and framework

We asked participants to report the cognitive load they experienced in using the MBRS or Google in terms of: the extent to which cognitive load was reduced while searching book reviews; the system's capability to present accurate/quality book reviews; and the time spent to find appropriate book reviews.

Participants were Taiwanese college students enrolled in a course named "Internet Investigation and Practice." Participant characteristics are provided in Table II. The study employed a within-subjects design with counterbalancing. As shown in Figure 3, the study was conducted during two online sessions lasting one hour each. Sessions were held two weeks apart. Students were randomly assigned to one of two groups: 20 were assigned to the MBRS-1 group and 17 to the Google-1 group. During the second session students were assigned to the opposite groups: 15 to MBRS-2 and 19 to Google-2. The small differences in sample sizes are due to differences in attendance on the day of each session. Individuals in the MBRS groups used the proposed MBRS to search for online book reviews, and their Google counterparts used Google for the same purpose. All participants completed a questionnaire consisting of items on personal background (part 1), actual online book review usage behavior (part 2), user evaluation of the two book review systems (part 3), and user opinions and suggestions for book review systems (part 4). Responses were analyzed quantitatively and qualitatively. Responses to items in part 3 "user evaluation" served as the primary data for evaluating the proposed MBRS and comparing it with Google.

Table III contains data on the participants' online book review usage patterns. As shown, 35.1 percent of the participants had experience searching for book reviews on the internet. One-quarter (24.3 percent) of the participants expressed the opinion that finding book reviews on the internet is a time-consuming task and 29.7 percent stated that it is difficult to find high-quality book reviews. Results from our analysis of participant preferences for online book review platforms are also shown in Table III. From the list of available platforms for collecting online book reviews in Taiwan, 78.4 percent preferred Google, 70.3 percent preferred Yahoo, and 70.3 percent preferred (Books.com.tw).

5.2 Experimental procedure

Participants were trained to use both the MBRS online system and the Google search engine to ensure they had the requisite skills for each tool. We then distributed MBRS or Google versions of the Online Book Review Research questionnaire to members of

Index	Example
Review title	A book review of *The Kite Runner*
Video review	Extracted from existing movie review (left figure) or self-made video-mediated book review (right figure)
	 
Book title	*The Kite Runner*
Reviewing author	Louis
Review publication date	May 15, 2009
Rank of this review	9
No. of times "Recommended"	20
No. of times "Not recommended"	3
Review excerpt	*Kite Runner* is a touching story … (excerpt limited to 100 words)
Button to read entire review	(more)
Button to "Recommend"	Recommend
Button to "Not recommend"	Not Recommend

Table I.
Content categories on the MBRS interface

Participants	
Age	
Min. to max.	18-24
Mean	19.3
Sex (%)	
Male	40.9
Female	59.1
Computer usage experience	
Min. to max.	4-5 years to > 12 years
Mean	9.1 years
Time spent on internet per day	
Min. to max.	0-2 hour(s) to 11-12 hours
Mean	5.36
Search counts per day	
Min. to max.	0-5 to > 21
Mean	8.27

Table II.
Participant characteristics

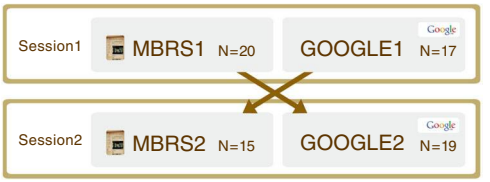

Figure 3.
Study design

Item content	Percentage of responses ($n = 27$) Strongly disagree 1	2	3	4	Strongly agree 5			
1. Before I read a book, I usually search for book reviews about it on the internet (%)	2.7	29.7	32.4	29.7	5.4			
2. I spend a lot of time searching for book reviews on the internet (%)	5.4	32.4	37.8	21.6	2.7			
3. I feel it is difficult to find good reviews for a book (%)	2.7	21.6	45.9	27.0	2.7			
4. Preference for online book review platforms[a] (multiple choices) (%)	1: 78.4	2: 70.3	3: 18.9	4: 18.9	5: 5.4	6: 70.3	7: 10.8	8: 8.1

Notes: [a]1, Google.com; 2, Yahoo.com; 3, KingStone.com.tw; 4, eslite.com; 5, yumau.com; 6, Books.com.tw; 7, PTT BBS Book board; 8, others

Table III.
Online book review usage behavior in daily life

the corresponding groups. Prior to the formal evaluation, participants were asked to fill in parts 1 and 2 of the questionnaire (personal information and online book review usage behavior). During the formal evaluation session, participants in both groups were asked to search for three books: *Harry Potter 5*, *The Kite Runner* and *The DaVinci Code*. After completing their searches, participants were asked to fill in parts 3 and 4 of the questionnaires.

6. Analyses and results

To support or refute *H1* on reducing information overload, we performed several student *t*-tests using data from the evaluation section of the questionnaire (see Table IV). As shown in Table V, participants in the MBRS group stated that they felt the proposed system significantly reduced their perception of information overload compared to Google, indicating that MBRS users were less burdened by information overload while searching for book reviews than were Google search engine users. Regarding *H2* (perceived accuracy and quality of retrieved book reviews), MBRS users were significantly more likely than Google users to claim that the system produced more accurate and higher quality reviews, suggesting that MBRS users were able to obtain better quality book reviews than Google search engine users. Regarding *H3* (the amount of time spent searching for appropriate book reviews), Google users were significantly more likely than MBRS users to spend more time searching for appropriate book reviews.

The distribution for the time required to find appropriate book reviews is shown in Table VI. Possible responses (one to seven) were less than one minute, one to two minutes, two to three minutes, three to four minutes, four to five minutes, five to six minutes and more than six minutes. As shown in Table VI, MBRS users reported spending significantly less time than Google users searching for book reviews. Results of a χ^2 test indicated a significant relationship between search time and the book review system being used ($\chi^2_{(6)} = 19.52$, $p < 0.01$). The largest percentage of Google group members (27.8 percent) spent more than six minutes finding an appropriate book review, compared to two to three minutes for MBRS group members (28.6 percent). None of the MBRS students spent more than six minutes.

Study goals	Questions
Reducing information overload	1. I feel the system is easy to use
	2. I feel relaxed while using the online book review system
	3. I feel the review information is disorganized and hard to read
	4. I feel the system interface is easy to read
System shows more accurate/quality book reviews	5. I feel the system accurately locates the desired reviews
	6. I feel the reviews returned by the system are appropriate for me
	7. I feel the system accurately sorted higher quality reviews from lower quality reviews
Time spent to find appropriate book reviews	8. How much time did I spend to find 5 reviews about *Kite Runner*?
	9. How much time did I spend to find 5 reviews about *Harry Potter 5*?
	10. How much time did I spend to find 5 reviews about *The DaVinci Code*?

Table IV. Items for user evaluation of book review systems

Experiments	MBRS ($n = 35$) *M*	MBRS ($n = 35$) SD	Google ($n = 36$) *M*	Google ($n = 36$) SD	*t*	Significance
Reducing information overload	3.69	0.58	3.16	0.61	3.71	$p < 0.001$
System shows more accurate/quality book reviews	3.50	0.55	2.70	0.61	5.73	$p < 0.001$
Time spent to find appropriate book reviews	3.43	1.50	4.69	1.93	−3.09	$p < 0.01$

Table V. User evaluation of book review systems

In addition to evaluating the study's main hypotheses, we also asked participants to respond to a number of items designed to elicit their opinions and suggestions for using MBRS or Google as book review systems (Tables VII-IX). Feedback on MBRS was generally very positive (Table VII). For items 1, 2 and 5, more than 90 percent of the participants indicated that they felt positively about using: the MBRS subscribe function to keep updated on new information regarding a particular book; the automatic book review sorting features for quickly browsing book reviews with different sorting methods; and the MBRS interface which provided a common structure for reviews from different sources. Nearly 60 percent of the participants liked the video-mediated book reviews (item 3), indicating video-mediated book reviews do have the potential to interest readers. Nearly 90 percent of participants liked using the "recommend" or "do not recommend" function, suggesting that they appreciated the opportunity to influence the ranking results by expressing their personal opinions (item 4). In terms of user preferences, 50 percent of participants preferred using the number of recommendations as the sorting method; 29.4 percent preferred the total rating and 8.8 percent prefer the number of videos as the sorting method (item 6).

Tables VIII and IX display some of the feedback provided by participants to the open-ended questions.

Table VI.
User evaluation – breakdown of time spent searching for appropriate reviews

Time	MBRS ($n = 35$) (%)	Google ($n = 36$) (%)
< 1 min.	5.7	8.3
1-2 min.	25.7	5.6
2-3 min.	28.6	13.9
3-4 min.	14.3	13.9
4-5 min.	11.4	25
5-6 min.	14.3	5.6
> 6 min.	0	27.8

Table VII.
Users' opinions for book review systems (MBRS condition)

		Percentage of responses				
		Strongly disagree				Strongly agree
	Item content	1	2	3	4	5
MBRS	1. I feel the "subscribe" book function is convenient (%)	0	0	2.9	71.4	25.7
	2. I think it was a good idea to design MBRS with automatic sorting features (%)	0	0	5.7	62.9	31.4
	3. I feel that video-mediated book reviews are more appealing than traditional text-based book reviews (%)	0	20	22.9	40	17.1
	4. I like being able to either select "recommend" or "do not recommend" reviews (%)	0	2.9	8.6	65.7	22.9
	5. Constructing a specialized multi-source book review system was a good idea (%)	0	0	5.7	45.7	48.6
	6. Preferred sorting method[a] (%)	1: 29.4	2: 5.9	3: 8.8	4: 50	5: 5.9

Notes: [a]1, total rating; 2, review length; 3, number of videos; 4, number of times "recommended"; 5, number of times "not recommended"

MBRS condition	
1: I have some suggestions about the MBRS interface	1. Make the interface more aesthetically pleasing 2. Add more hypermedia 3. The interface is simple but a little boring
2: I have some suggestions about the function of MBRS	1. Provide some reviews from famous people 2. Add a function for leaving a message 3. Only allow each user to recommend a review one time, to prevent "cheating" 4. Add a "browse history" function 5. Allow sorting by how much time it takes to browse each review
3: I have other suggestions on the MBRS	1. (A number of readers were curious about the recommendation function) 2. Please promote this book review system, I like it 3. MBRS could replace the ranking score with stars 4. Add the sales volume and publisher to the information about the book
4: What are the most special features of the MBRS?	1. Video-mediated reviews are persuasive and interesting to readers 2. I can quickly find useful book reviews with the MBRS 3. Book reviews can be understood fully at a glance without advertisements

Table VIII. Users' suggestions for book review systems (MBRS condition)

Google condition	
1: I encountered some difficulties while searching for book reviews with Google	1. I got lots of irrelevant information, such as movie reviews and advertisements that I didn't want 2. I do not know how to input the book's keyword 3. The sorting method seems a little "weird" 4. I have to adapt to different formats of different online book review systems
2: I have some suggestions about finding book reviews with Google	1. Add a specialized book review search engine 2. Automatically hide information unrelated to book reviews 3. Sort the reviews by quality 4. Separate the reviews written by experts and general readers

Table IX. Users' opinions and suggestions for book review systems (Google condition)

7. Conclusion

People often feel frustrated when searching for book reviews. Generally speaking, readers use a search engine as their first tool in looking for online reviews, but these typically provide too much irrelevant information, resulting in information overload. Our findings show that Google is the first choice of Taiwanese students looking for book reviews, followed by Yahoo and Books.com.tw. This study compared book review searches performed on the MBRS with searches performed using the Google search engine, and found that MBRS users were confronted with less information overload, were able to find higher quality reviews, and were able to do this in less time than were Google users. We also found that most participants enjoyed being able to subscribe to

book reviews to stay up-to-date with new information on their chosen books. This study also investigated the attractiveness of video-mediated reviews and found that more than half of the participants found video-mediated book reviews to be more appealing than traditional text-based reviews. Finally, nearly all participants believed that it was a good idea to construct a MBRS.

Since internet book reviews can be regarded as an electronic word-of-mouth for books, this study provides some useful information for online booksellers. Previous studies have pointed out that the electronic word-of-mouth effect of internet book review affect the purchasing decisions of some consumers and contribute to increased book sales (Lin *et al.*, 2007). Based on this study, internet booksellers may benefit from enhancing their web sites with innovative functions such as video-mediated book reviews. Further, readers can also benefit from getting the books they really want by reading appropriate reviews in advance.

8. Future work

Future work might strengthen the recommendation mechanism and make the sorting method more accurate. In terms of measurement, the current study used measures of subjective perceptions and objective performance to assess the extent to which cognitive load can be reduced through use of the MBRS. Future development of the system might benefit from exploring ways in which the system itself might log the time required for different searches and use self-report data to estimate how long it takes users to find satisfactory reviews.

Based on participants' responses to our open-ended questions, another possible modification is to separate book reviews into different groups based on the writers of the reviews (e.g. experts vs general readers), since some people prefer the opinions of experts while others prefer those of the general public. When the number of reviewed books increases, the system could further categorize books according to their genre (e.g. biographies, mysteries, or science fictions) and allow people to search by genre. Since we now only combine reviews from blogs and bookstores, we could also add more sources to the MBRS. A final line of development being considered involves making the interface more aesthetically pleasing.

For search engine designers, search results should be presented in a more structured way that allows for easier user comprehension (Kao *et al.*, 2008). In terms of book reviews, presenting reviews in a coherent and orderly fashion reduces cognitive load and allows readers to focus attention on the reading task itself. Additionally, integrating book reviews with different media types (e.g. video) may also be an effective means of accommodating individual styles and enhancing motivation. Internet booksellers or library staff may use this as an effective means to attract potential readers. For example, libraries could incorporate this feature into library interface design and allow students to upload their self-made video book reviews on the library web site to interest other readers. User-generated information on books would result in a rich resource for reference.

This was intended as a non-commercial project and, as such, we have no plans to "market" it. We eventually hope to make it available for non-commercial educational purposes to users such as school libraries. However, this is still a prototype version and we have not yet considered precisely how the software might be distributed. The most feasible way to distribute this system or the major feature "video-book reviews" of the system would likely be through school libraries. Libraries could incorporate this feature into their online library interface design and, for example, host contests to

encourage students to upload their own self-made video book reviews. When students upload their video reviews, the question of copyrights could be handled by allowing the students themselves to decide whether to make them public. Users whose videos receive the most "favorites" could win a prize. Visually impaired students would then benefit from being able to listen to such reviews, although they would likely still require assistance with other aspects of the system.

Ready access to high-quality book reviews is an issue with wider implications for education. Chen (2008) argues that internet community forums, such as blogs, give group members an opportunity to gather and organize opinions and thus encourage group members to share information and gain knowledge. Efficient access to such reviews and more opportunities for interactions with other readers can be expected to enhance learning (Harley and Fitzpatrick, 2009). We believe that when it comes to online book reviews a great deal of potential has yet to be explored.

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