

**BOOK RECOMMENDATION INTERNET BROWSER SYSTEM (BRIB)**

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**ABSTRACT**

*A book or literature recommendation process usually requires a person to become a member or user of an online book store, an online book club, an online library or a social network application. This traditional form of book recommendation lacks in comprehensiveness when keeping up with the rapidly growing information on the Internet. In this study, the authors present a novel idea and practical methods to capture, monitor and measure the flow of knowledge on the Internet by using a new integrated Internet browser. This platform, from here onward is referred to as Book Recommendation Internet Browser (BRIB). BRIB is based on the Knowledge Browser Monitoring System (KBroMS), a Knowledge Management Browser, developed by Malaysian applied research and development center, MIMOS Berhad (Musa, Hamzah, Awis, Johari, & Yusrin, 2013). BRIB's user profiling engine is able to generate book or literature recommendations in the form of bibliography and citations to the user. BRIB enables the user to receive real-time book or literature recommendations while surfing the Internet sites such as Facebook, blogs and even search browsers such as Google. The browser accelerates the processing of Big Data from the Internet and Artificial Intelligence relational analytics match the relevant book or literature according to the user's surfing and search patterns. The relevant books or literature in addition to the surfing searches add to the knowledge base of the user. BRIB is a tool that can help children, adults as well as the elderly in their pursuit of lifelong learning and education.*

**Field of Research:** Book Recommendation, Education Technology, Knowledge Browser, Knowledge Profiling.

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## Introduction

The Internet is a worldwide interconnection of user networks. Since 1994 it has been expanded to serve public users and is emerging to be a very powerful platform for human activities. According to the International Telecommunication Union (ITU) report, as at March 2013, there are 2,749 million users (38.8% of the world's population) connecting to the Internet (ICT Data and Statistics Division, 2016). Pingdom website reported that in 2012, there are 634 million websites; 1 billion of monthly active users on Facebook; 175 million average number of tweets sent every day, and 1.2 trillion number of searches on Google (Neuzil, 2006). The Internet is huge, it has changed the way we live, and it is still changing and growing all the time.

The rapid growth of Internet and the worldwide connection of users make it a solid platform for learning and knowledge sharing. Today, there are many online resources to help improve people knowledge – online encyclopedias (e.g. Wikipedia), online newspapers (e.g. Southport Reporter), e-Library (e.g. Internet Public Library), e-Class (e.g. Coursera), e-Book (e.g. Project Gutenberg), etc. Unfortunately, there is no standard or single way to harvest and share knowledge on the Internet. This is because there is no single site or application to help users to track their progress on various knowledge-related Internet activities, nor to help them to monitor the flow of knowledge from those activities.

Existing Internet browsers do not have a generic or fundamental way to allow users to do real-time interaction if the websites they visiting or their applications are different. Today, the common practice to resolve the abovementioned problem is to specially define a customized protocol(s)/channel(s) between the two websites or applications in order to allow users in those groups to communicate and exchange information. Knowledge on the Internet is very scattered; each site or application has their own way to define data structure and programming logic to interpret the data, making each of them a silo to others. The effort to define customized communication channel(s) grows exponentially when the number of websites or applications increase.

In terms of book or literature recommendation, this usually requires a person to become a member or user of an online bookstore, an online book club, an online library or a social network application. This traditional form of book recommendation lacks in comprehensiveness when keeping up with the rapidly growing information on the Internet. In this study, the authors present a novel idea and practical methods to capture, monitor and measure the flow of knowledge on the Internet by using a new integrated Internet browser. This platform, from here onward is referred to as Book Recommendation Internet Browser (BRIB). BRIB is based on the Knowledge Browser Monitoring System (KBroMS), a Knowledge Management Browser, developed by Malaysian applied research and development center, MIMOS Berhad. BRIB's user profiling engine is able to generate book or literature recommendations in the form of bibliography and citations to the user. BRIB enables the user to receive real-time book or literature recommendations while surfing the Internet sites such as Facebook, blogs and even search browsers such as Google. The browser accelerates the processing of Big Data from the Internet and Artificial Intelligence relational analytics match the relevant book or literature according to the user's surfing and search patterns. The relevant books or literature in addition to the surfing searches add to the knowledge base of the user. BRIB is a tool that can help children, adults and the elderly in their pursuit of lifelong learning and education.

BRIB looks like other browsers but specializes on monitoring user activities in knowledge sharing and knowledge environment. By using BRIB, users can have a profile that will keep track of all the activities that a user performs on the Internet. This will then be visualized as a report which is based on pie chart format and uses the SECI model as reference for plotting (Nonaka, 1997). BRIB is developed on PHP and VB.Net programming languages while using MySQL as its backend database server.

## Methodology

This chapter first introduces the BRIB solution for real-time book recommendations then explains the system and components of BRIB.

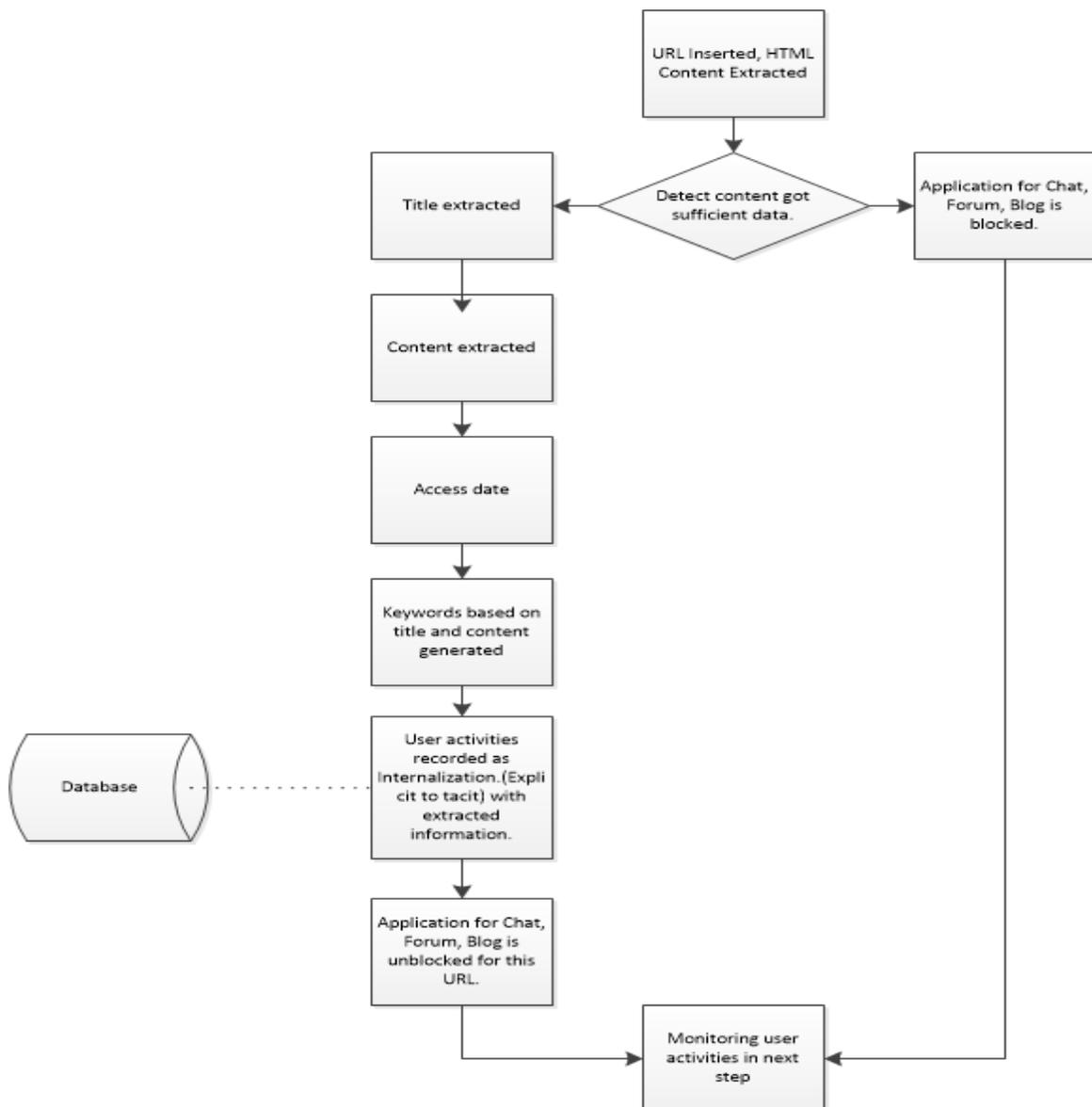
## BRIB solution

This summarized or knowledge flow based on a user's Internet activities is as follows:

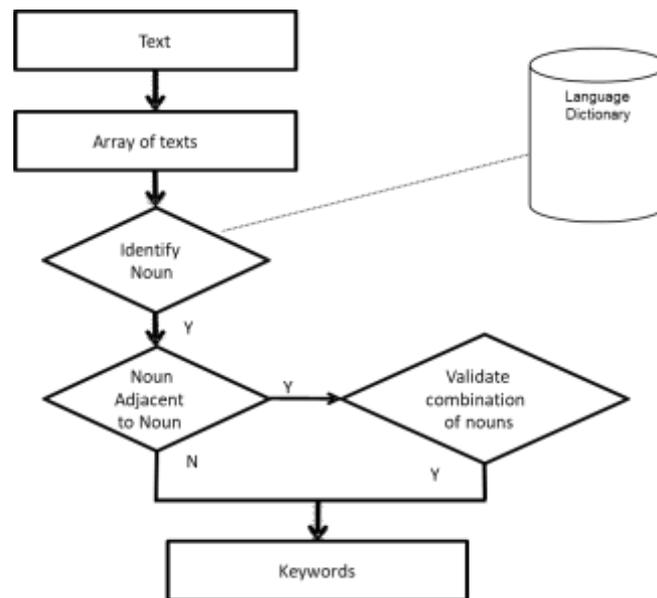
1. The system at first tries to group users based on semantic similarity extracted from their activities as shown in **Figure 1**. This can be achieved via following method:
  - Determine the domain of activity from the URL.
  - Extract the keywords and meanings from the user's activities as shown in **Figure 2**.
  - Connect users with similar interests based on the semantic similarity harvested from their activities.
  - Book recommendations of related URLs is done based on **Figure 3** activity.
2. The system provides a centralized, unique and exchangeable way for every user to communicate and exchange information even though they are accessing different URLs or web applications as follows:

The system models user activities in three categories, (i) tacit to tacit, (ii) tacit to explicit and (iii) explicit to explicit. These are the three main categories for knowledge measurement in user's profile based on the model described in

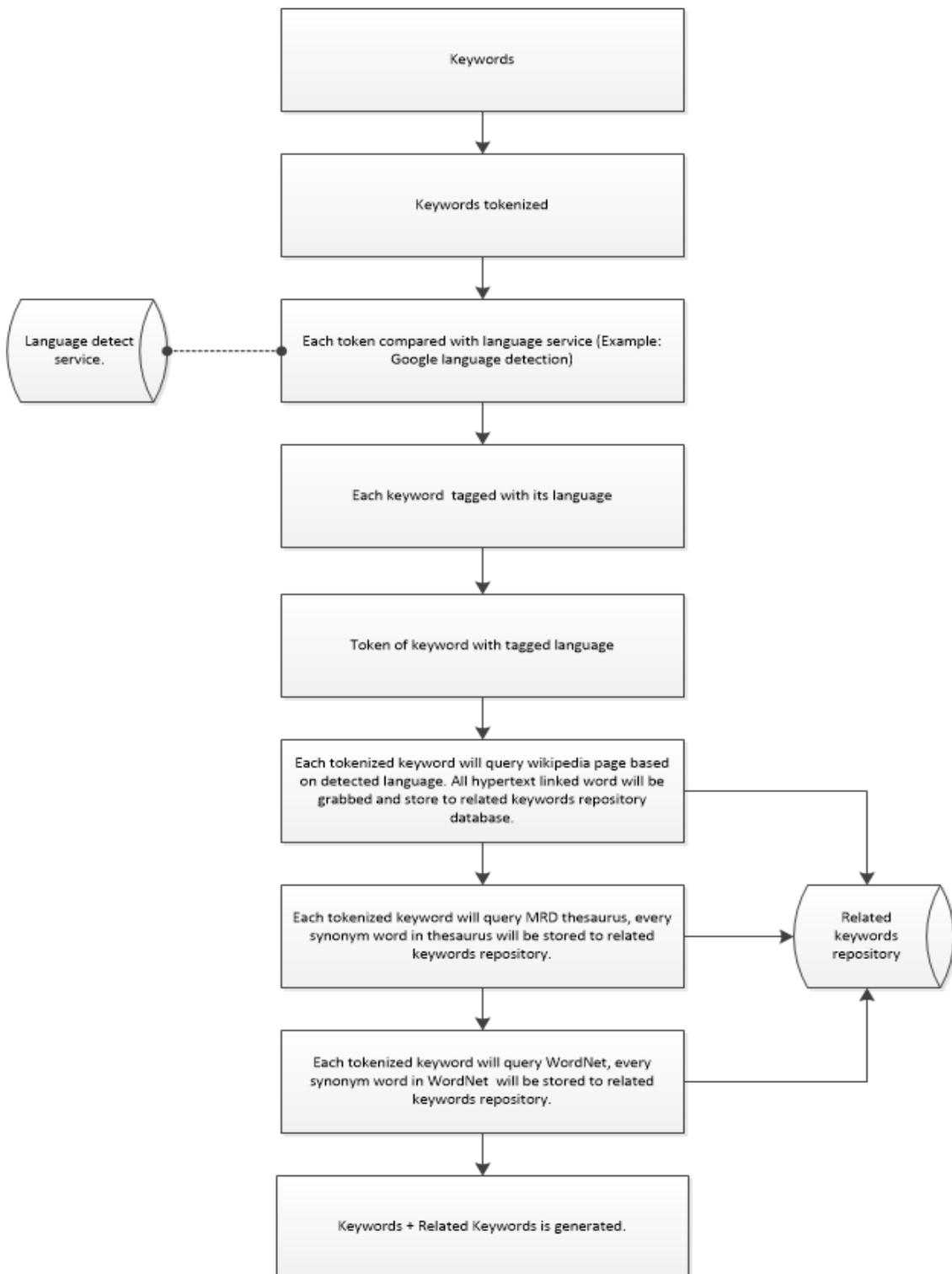
- **Figure 4.**
- A predefined mapping table is used to define the relationships between Internet activities and knowledge categories.
- Quantitative and qualitative measurement methods are used to analyze the knowledge levels from user activities.



**Figure 1: Extract keywords and meanings from user activities**

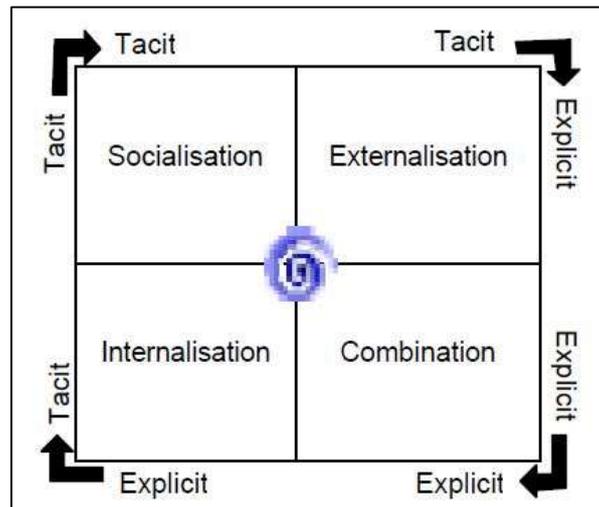


**Figure 2: Detailed process for generating keywords based on title and contents**



**Figure 3: Process to obtain related keywords from a keyword**

The SECI model of knowledge dimensions is widely used to represent knowledge in the Knowledge Management domain. The four knowledge conversion methods in the SECI model are Socialization, Externalization, Combination, and Internalization. All these knowledge conversion methods arise due to continued interaction between tacit and explicit knowledge (Cao, Yao, Li, Zhai & Zu, 2010). Besides this, the effective collaboration of socialization-externalization-combination-internalization in the SECI model has contributed to the success of many business activities as it uses adequate time for each conversion of knowledge, either from tacit to explicit, or explicit to tacit (Suzuki & Toyama, 2004).



**Figure 4: SECI model of knowledge dimensions as defined by Nonaka & Takeuchi, 1995**

**Figure 4** illustrates the SECI model with dynamic knowledge conversions in each quadrant. The four conversion methods involving tacit and explicit knowledge are as follows:

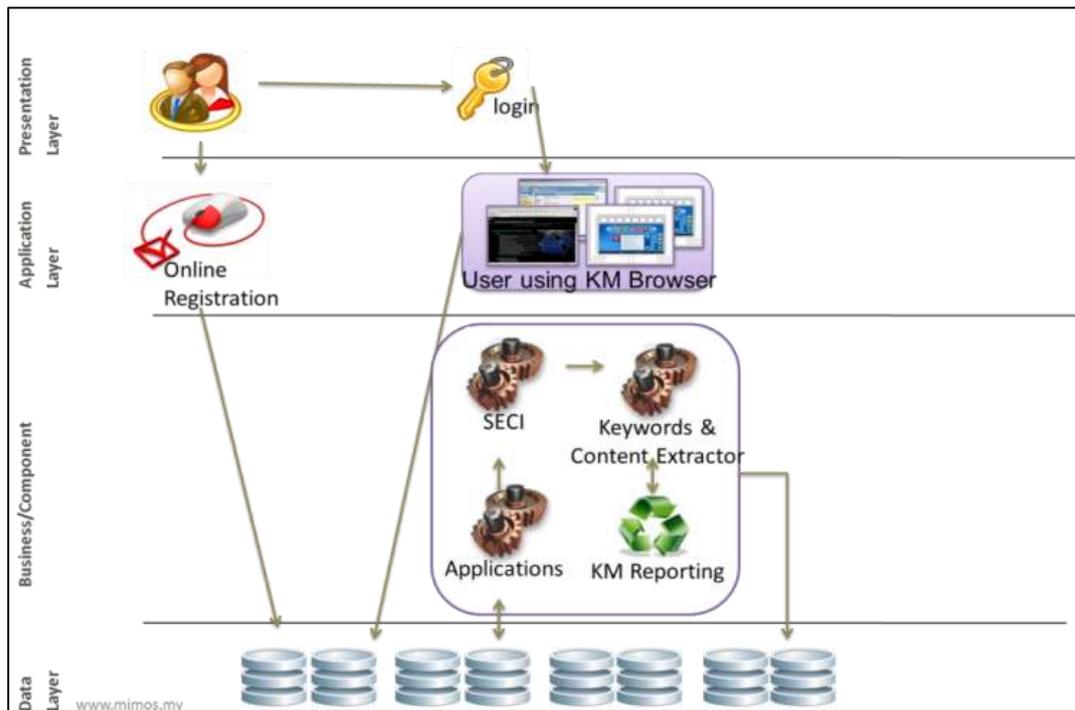
- From tacit to tacit (i.e., Socialization)
- From tacit to explicit (i.e., Externalization)
- From explicit to explicit (i.e., Combination)
- From explicit to tacit (i.e., Internalization)

## BRIB Platform

BRIB is a knowledge browser which is developed to determine the knowledge flow by monitoring user Internet browsing activities. This system consists of several components:

- Book Recommendation
- Blog
- Chat
- Forum
- File Sharing
- My Webpage
- My Buddy List
- Media Album
- Report

## BRIB System Flow



**Figure 5: BRIB system flow**

**Figure 5** displays the general flow of the system at each layer. At the presentation layer, prior to using the system, the user needs to login to the system; new users need to do the online registration. The registration process requires the user to validate the registration process via e-mail. After the registration process is complete, the user can login to the system and start browsing the Internet as usual. The difference between a typical Internet browser and BRIB is that BRIB comes with features for book recommendation, and captures and measures user knowledge activities on the Internet based on the SECI model. Besides this, each content of the URL will be analyzed by the Keyword and Content Extractor to measure the knowledge flow and generate a report for each user profile.

## Login and Profile

BRIB require a user to register to the system for user profiling. **Figure 6** displays the BRIB login page user interface.



Figure 6: BRIB login page

After successful login, BRIB will display the profile page. Figure 7 displays the BRIB user profile page user interface.

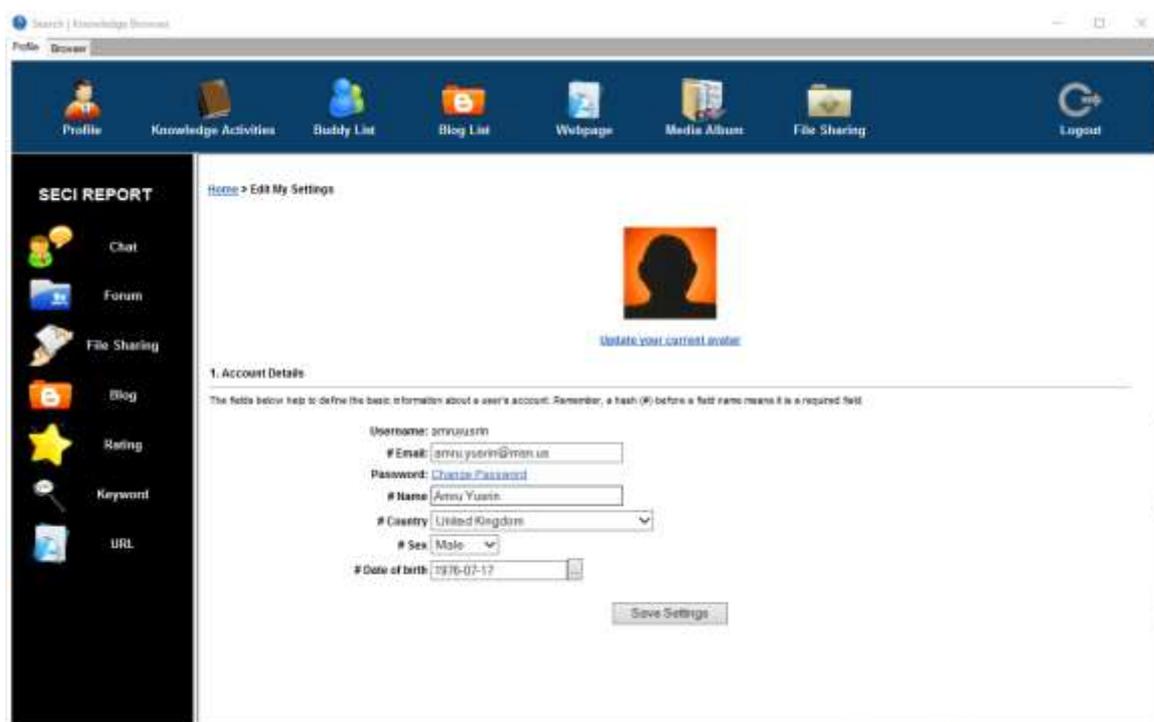
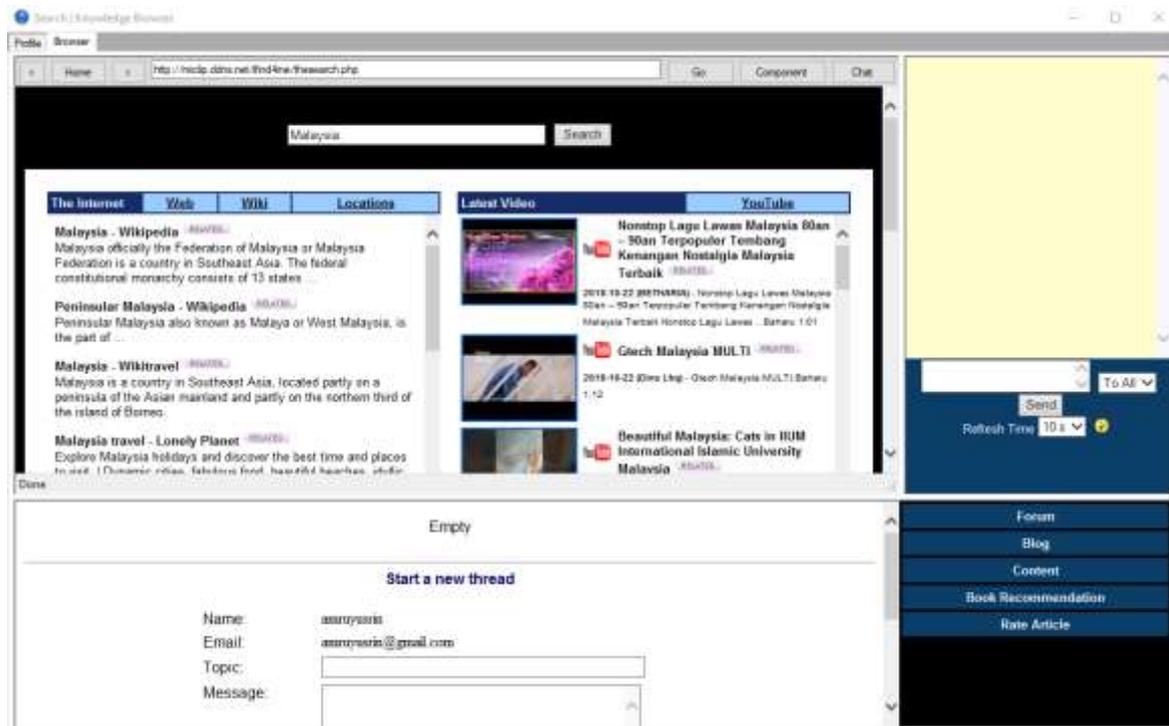


Figure 7: BRIB user profile page

## Browser User Interface

To access the main Internet browser, the user needs to click on the browser's tab. The main Internet browser user interface includes other components such as book recommendation, forum, blog, chat and contents. **Figure 8** displays the BRIB's main Internet browser.



**Figure 8: BRIB main Internet browser**

Users can surf the Internet by inserting on the URL bar similar to regular Internet browsers.

## Book Recommendation

The book recommendation feature can be used by pressing the “Book Recommendation button”. BRIB will analyze webpages that are browsed in the main web browser and the recommended books will be displayed under the main browser panel such as in **Figure 9**:

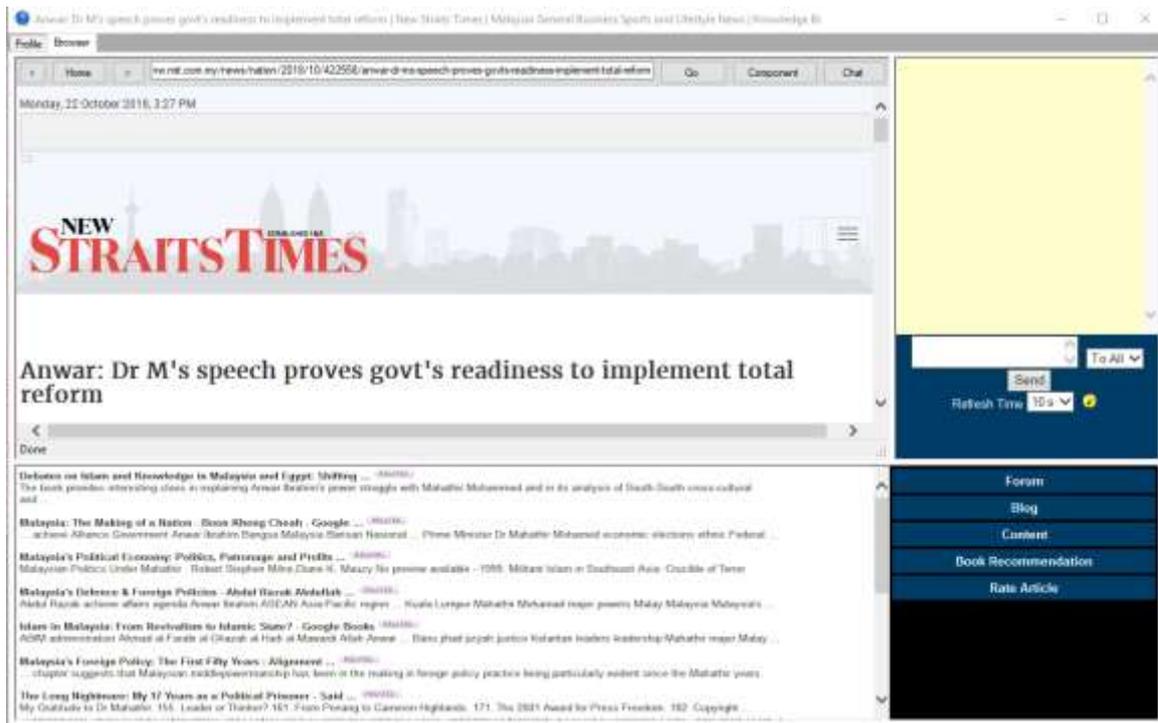


Figure 9: BRIB book recommendation feature

## Experiment and Results

The book recommendation accuracy test has been conducted and experiments have been done. 200 URLs have been tested in three groups of test sets; 50 URL set of news in English language, 50 URL set of news in Malay language and 100 set of URL of website pages that contain multiple layout such as Facebook, Twitter, corporate websites and many more. **Table 1** shows an accuracy result of the book recommendation engine:

URL Test Set	Accuracy
50 URL of news in English	80%
50 URL of news in Malay Language	65%
100 URL of website pages	60%

Table 1: Book recommendation accuracy results

The accuracy of the engine is validated by humans and does not use any machine learning engine. The maximum results returned by the book recommendation engine for each URL tested is 10 URLs. The accuracy percentage in **Table 1** is the minimum value of the total tested URL accuracy in each group. The test results show that the accuracy in the Malay language news is lower than in the English language news test set due to the lack of the Malay language dictionary in data to analyze text; the 100 URL of website pages test is set to the lowest in book recommendation accuracy because from the content extracted, the system was unable to locate the main text content as the websites contain a lot of table and JavaScript content.

## Conclusion

In this paper shows how BRIB enables users to receive real-time book or literature recommendations while surfing Internet sites such as Facebook, blogs and even search browsers such as Google. The browser accelerates the processing of Big Data from the Internet and Artificial Intelligence relational analytics match the relevant book or literature according to the user's surfing and search patterns. The relevant books or literature, in addition to the surfing searches, add to the knowledge base of the user. BRIB is a tool that can help children, adults and the elderly in their pursuit of lifelong learning and education. The user activities are also captured by BRIB and mapped to each quadrant of the SECI model.

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