

Undergraduate Information-seeking Behaviour Framework in an Electronic Environment

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Abstract—Information-seeking behaviour differs among students due to the differences in their information needs and gaps. Previous studies concluded that lack of knowledge about information-seeking behaviour is one of the factors that contribute to students' failure in searching for useful information. Therefore, research on undergraduate information-seeking behaviour is important to facilitate in searching for and retrieving the required information effectively. The purpose of this paper was to develop an undergraduate information-seeking behaviour framework in seeking academic information. Data was collected using questionnaires administered to 346 undergraduate students randomly selected from Universiti Utara Malaysia. The collected data was analysed by using the Statistical Package for Social Science (SPSS). Based on the findings, the undergraduate information-seeking behaviour framework in an electronic environment was developed. This framework can be adopted by lecturers to facilitate better information-search strategies during information-seeking activities in finding the relevant information effectively.

Index Term—Information Retrieval; Information Seeking; Information Behaviour; Information-Seeking Behaviour.

I. INTRODUCTION

Information can be retrieved easily nowadays in two different ways, which are printed and electronic source. In recent years, the growth of the Internet has enabled students to access information easily. The excess of information which can be found on the Internet requires students to have information-seeking skills. Good information-seeking skills will benefit students in retrieving relevant information effectively. Students need to identify the appropriate keyword for searching information, know which search engine provides reliable sources, and be able to use any tool to complete course assignments. Although a lot of advantages are provided by online sources, the majority of students are not able to perform effective and efficient information-searching using online sources.

A research about undergraduate information-source usage by He et al. [1] found that undergraduate students frequently retrieved information from online sources. Online sources were broadly used because they are easy to use and information can be retrieved as long as Internet connection is available. A study conducted by Nadzir [2] showed that undergraduate students of the School of Computing relied heavily on Google as the main source to retrieve information. Lee et al. [3] found that undergraduate students preferred

online sources rather than printed sources to complete their tasks or assignments. Therefore, research on undergraduate information-seeking behaviour is important to facilitate in searching and retrieving the required academic information effectively. This study aimed to develop an undergraduate information-seeking behaviour framework to seek academic information.

II. LITERATURE REVIEW

A. Information-seeking Behaviour

Information-seeking behaviour varies depending on the individual. It can also be affected by the kind of information they need and the kind of information source they use. Information-seeking behaviour is a process of identifying information needs, information sources, managing retrieved information and using the information to fulfil the information needs [2]. Information-seeking behaviour is also defined as strategies in decision-making to select information that people require to complete their work or tasks [4]. According to Wilson, information-seeking behaviour is searching for information that needs to achieve some goals where the person may deal with a manual information system or a computer-based system [5].

Information need is a process to fulfil a requirement in order to solve a problem. The requirement of information need varies according to individual characteristics such as gender, age and level of study. Information search is a process of finding the needed information. Information source is a collection of information accessibility in the form of a hardcopy or a softcopy. It can be either online or offline. Information use describes how information is used in order to accomplish the research process [6]. Information evaluation is a process of choosing the appropriate information that meets the criteria of the seeker. Students usually evaluate information based on three criteria; the information is relevant, easy to understand and is available to be accessed [7]. Information evaluation is the important step to establish good quality information. Knowing the goal and motivation, and what to do with the information is the first step to acknowledge a good evaluation process skill [8].

B. Electronic Environment

Electronic information sources are collections of information stored and retrieved by using electronic devices such as computers and smartphones. Information can be

retrieved using online search services, Online Public Access Catalogues (WebOPAC), CD-ROM and the Internet [9]. Online sources are preferably used by students because information can be accessed 24 hours a day as long as the connection to the Internet exists [10]. Other electronic information sources are search engines, such as Google and Yahoo. E-books, e-journals and e-newspapers are online publications that are used to replace the printed version. The way of information retrieval has become easier than before [11].

Nadzir and Salim [9] state that students of Universiti Kebangsaan Malaysia prefer to seek information from the Web and other online sources for completing research projects. A study by S. Majid & D. Kanagasabai [10] found that students prefer to use the Internet as a medium of information source. Seeking information becomes faster by using online sources. Singh and Kumari [11] show that students of the Bhagat Phool Singh Institute of Higher Learning prefer to use online sources for collecting information. Grgić and Miočić [12], in the University of Zagreb, stated that students are heavily using online library catalogues and open access journals as information sources to seek information.

C. Information -seeking Behaviour Related Model

Many researches have been conducted to understand information-seeking behaviour. Models and frameworks are mostly used to describe the flow of information-seeking skills. Ellis's model focused on a system rather than a person's behaviour. Kulthau's model and Wilson's model were different from Ellis's model. Both models described more about how a person should behave or act [13, 14, 15].

Ellis's information-seeking behaviour model contains eight elements of process or features. They are starting, chaining, browsing, differentiating, monitoring, extracting, verifying and ending [13].



Figure 1: Ellis's model

- Starting means the user or the person starts to find the information; for example, if the student needs to find some information regarding healthcare, the student first has to be an expert in the health area.
- Chaining describes the reference or the citation provided by the information, for example, reading from a journal, a student can track more related information from the reference section [13].
- Browsing is the process of finding information by referring to the author, journal, conference, etc.
- Differentiating means recognizing which information

source is suitable for information searching [14].

- Monitoring the information is retrieving and being aware of new information [15].
- Extracting is the process of extracting the related information from the retrieved information.
- Verifying the accuracy of the information ensures the information is solid to use.
- Ending means the end of the searching information process [13].

Kulthau's model is based on user feelings, thoughts and actions. The aim of this model is to provide the stages of information search. This model contains six stages which are initiation, selection, exploration, formulation, collection, and presentation. Initiation is the stage where the user identifies the information need while selection is where the user clarifies the topic of the study. The exploration stage occurs when the user searches for information based on the topic. Formulation is the stage of creating strategy by focusing on the topic perspective, and collection contains the process of gathering information based on the formulation stage. Presentation is the stage when information collecting is done [15].

Wilson's model is based on personal action behaviours. When a user searches for an answer it will lead to information need. From the information need it will drive the user to search for information by using the information source or information system. It is natural of human beings to commonly exchange information among each other and this is contained in Wilson's model [16].

A model is usually used to describe the process to accomplish the objectives. These three models were used to understand and structure the proposed framework in this study. Ellis's model was used to illustrate how the information-seeking processes are involved in a system. Kulthau's model and Wilson's model were used to illustrate the person's action to gain information.

III. METHODOLOGY

A. Conceptual Framework

The framework comprised of four variables, which were information need, information search, information evaluation and information use. The variable that focused on the electronic environment consisted of three stages: information search, information evaluation and information use.

- Information Need
Information need is the information required to fulfil or complete course assignments.
- Information Search
Information search is the process of seeking the required information using electronic information sources. There are many techniques that can be used by undergraduate students when searching for information such as using keywords, and making use of the limiter and Boolean operator.
- Information Evaluation
Plenty of information is available online. However, sometimes the retrieved information does not meet students' needs. Therefore, they must evaluate the

retrieved information in order to identify the suitable information which meets their needs.

- Information Use

After the information has been categorized by its needs, the material will be used accordingly by copying directly the information or interpreting it and using their own words to complete course assignments.

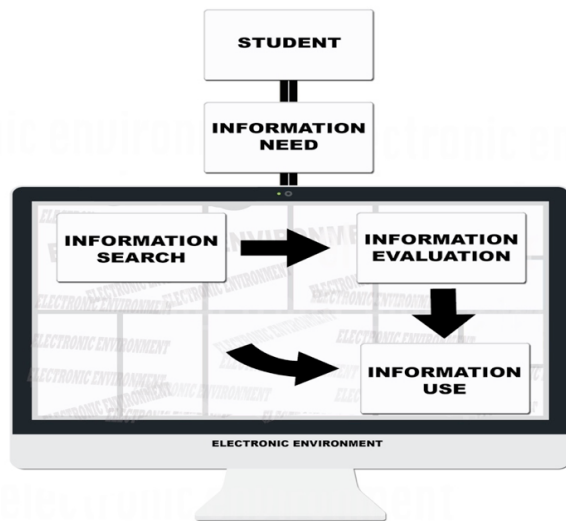


Figure 2: The conceptual framework of the undergraduate information-seeking behaviour in an electronic environment

A questionnaire was constructed by operationalizing the components of the conceptual framework along with questions pertaining to the demography of the respondents. The questionnaire was adapted from Timmers and Glas [17]. A pilot survey was conducted to test the validity and reliability of the questionnaire among a group of 30 undergraduate students at Universiti Utara Malaysia. Based on the returned questionnaires and respondents' comments from the pilot survey, the questions were revised accordingly and considered valid and reliable for the actual survey.

B. Survey

The sample size was determined by using the Krejcie and Morgan Table [18]. According to the Academic Student Affairs Department of UUM, the total number of undergraduate students registered in September 2015/2016 (A151) was 3217. Based on the Morgan Table, the sample size is equivalent to 346. Therefore, 346 Universiti Utara Malaysia undergraduate students were randomly chosen. The questionnaires were distributed personally to the respondents. The respondents were asked to complete the questionnaires immediately after receiving them and return them directly to the researcher.

IV. RESULT AND DISCUSSION

A. Undergraduate information-seeking behaviour framework in an electronic environment

Spearman's Rho was used to explore the strength of the relationship between two continuous variables. The test was

used to measure the relationship between the variables in the conceptual framework. Spearman's Rho result is tabulated in Table 1.

Table 1
Spearman's Rho Results

| Variable | Information Search | Information Evaluation | Information Use |
|------------------------|--------------------|------------------------|-----------------|
| Information Search | 1.00 | | |
| Information Evaluation | 0.512** | 1.00 | |
| Information Use | 0.427** | 0.602** | 1.00 |

N=346, **. Correlation is significant at 0.01

As demonstrated in Table 1, there is a correlation between information search and information evaluation at the significant level $r = 0.512$. The H_{01} hypothesis is rejected due to r value showing a strong positive correlation between information search and information evaluation. The H_{a1} hypothesis is accepted. The result of the analysis between information search and information use also gives a positive result. There is a significant relationship between both variables at $r = 0.427$. r value shows positive correlation between information search and information use. The result fails to retain the null hypothesis, and the alternative hypothesis is accepted. The strength of relationship between information evaluation and information use is also significant at $r = 0.602$. Again, the null hypothesis is rejected due to r value showing positive correlation between information evaluation and information use. The alternative hypothesis is accepted as shown in Table 2.

Table 2
Hypotheses Results

| No | Hypothesis | Result |
|----------|---|----------|
| H_{01} | There is no significant relationship between information search and information evaluation. | Rejected |
| H_{a1} | There is a significant relationship between information search and information evaluation. | Accepted |
| H_{02} | There is no significant relationship between information search and information use. | Rejected |
| H_{a2} | There is a significant relationship between information search and information use. | Accepted |
| H_{03} | There is no significant relationship between information evaluation and information use. | Rejected |
| H_{a3} | There is a significant relationship between information evaluation and information use. | Accepted |

Figure 3 below shows undergraduate information-seeking behaviour framework in an electronic environment. This framework is purposely designed for examining the behaviour of students in searching for information to support their academic work. Moreover, the framework acts as initial guidelines for lecturers and librarians to develop training programmes for new undergraduates.

The correlation analysis shows that information search has a positive significant relationship with information evaluation and use, whereas, information evaluation has a strong positive relationship with information use. Therefore, the relationships found in this research are consistent with the previous study in information-seeking behaviour [9].

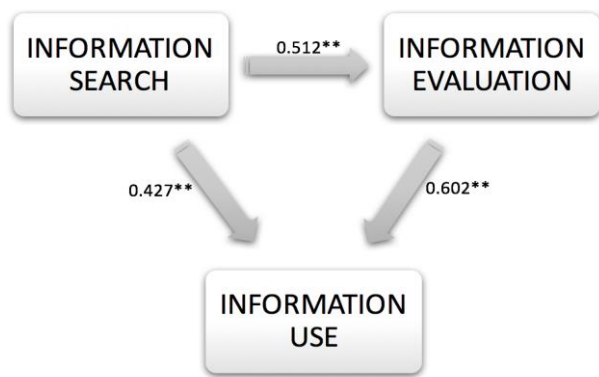


Figure 3: Proposed undergraduate information-seeking behaviour framework in an electronic environment

B. Personal Factor

This section discusses the personal factors that influence undergraduate information-seeking behaviour. T-test and one-way ANOVA were used to compare the mean amongst the demographic variables.

C. Gender

T-test was used to identify the differences between genders in searching and evaluating information. The result shows that the mean value between males and females are almost the same with 2.504 and 2.494 respectively. The result of the T-test is 0.162 and the significant value is larger than 0.05 at 0.872. There is no significant mean information search score for males and females.

The mean score between genders and information evaluation for males is 2.363 and for females is 2.611. The result of the t-test value -3.957 significant at 0.000 is less than 0.05. There is a different information evaluation mean score between males and females.

The result for gender and information use shows that mean value is 2.406 (males) and 2.411 (females). It is equal to -0.079 t score and the significant value is 0.937. The significant value shows that there is no significance between gender and information use.

Table 3
T-test between Gender and Information Search

| | N | Mean | SD | t | Sig |
|-------------------------------|-----|-------|--------|--------|-------|
| INFORMATION SEARCH | | | | | |
| Male | 172 | 2.504 | 0.6265 | | |
| Female | 174 | 2.494 | 0.4669 | 0.162 | 0.872 |
| INFORMATION EVALUATION | | | | | |
| Male | 172 | 2.363 | 0.6591 | | |
| Female | 174 | 2.611 | 0.5000 | -3.957 | 0.000 |
| INFORMATION USE | | | | | |
| Male | 172 | 2.406 | 0.6391 | | |
| Female | 174 | 2.411 | 0.5067 | -0.079 | 0.937 |

P < 0.05

Students' gender does not increase the skill in searching for information but it shows the difference in evaluating the

information. The T-test result shows that gender is not affecting the efficiency in searching for information. These findings are the opposite of Ronald's study. Ronald [19] found that females play a good role in searching for information. Female students regularly seek information than male students [20].

Table 4

T-test Result for Information Search, Information Evaluation and Information Use

| | Information Search | Information Evaluation | Information Use |
|--------------|--------------------|------------------------|-----------------|
| Male/ Female | Not significant | Significant | Not Significant |

D. Academic Factors

The ANOVA technique was used to analyse the difference between the levels of study and study major for all the variables, namely information search, information evaluation and information use.

E. Level of Study and Information Search

The result of the one-way ANOVA test between study major and information search shows that the F value is 0.891 and the p value is 0.446 and are not significant at the 0.05 level. The result shows that the level of study does not influence the way undergraduate students search for information.

Table 5

Result of ANOVA Test on Level of Study and Information Search

| Year | | Sum of Squares | Df | Mean Squares | F | p |
|-----------------|---------------|----------------|-----|--------------|-------|-------|
| 1 st | Between group | 0.813 | 3 | 0.271 | 0.891 | 0.446 |
| 2 nd | Within group | 104.020 | 342 | 0.304 | | |
| 3 rd | Total | 104.833 | 345 | | | |
| 4 th | | | | | | |

P < 0.05

F. Level of Study and Information Evaluation

The results shown in Table 6 represent the results of the level of study and information evaluation using the one-way ANOVA. The F value is 5.575 and the p value is 0.001. The p value is below the significant value of 0.05. This shows the level of study influences the information evaluation process.

Table 6

Result of ANOVA Test on Level of Study and Information Evaluation

| Year | | Sum of Squares | Df | Mean Squares | F | p |
|-----------------|---------------|----------------|-----|--------------|-------|-------|
| 1 st | Between group | 5.730 | 3 | 1.910 | 5.575 | 0.001 |
| 2 nd | Within group | 117.159 | 342 | 0.343 | | |
| 3 rd | Total | 122.889 | 345 | | | |
| 4 th | | | | | | |

P < 0.05

G. Level of Study and Information Use

As shown in Table 7, the result for the level of study and information use is the F value is equal to 1.515 and the p value

is not significant at 0.210. The p value shows that information use is not affected by the level of study.

Table 7
Result of ANOVA Test on Level of Study and Information Use

| Year | | Sum of Squares | Df | Mean Squares | F | p |
|-----------------|---------------|----------------|-----|--------------|-------|-------|
| 1 st | Between group | 1.499 | 3 | 0.500 | 1.515 | 0.210 |
| 2 nd | Within group | 112.769 | 342 | 0.330 | | |
| 3 rd | Total | 114.268 | 345 | | | |
| 4 th | | | | | | |

P < 0.05

H. Study Major and Information Search

The result for study major and information search is shown in Table 8 below. The result of the study major and information search shows that the F value is 1.039 and the p value is 0.355. The p value is higher than the significant value p<0.05 and the study major does not affect undergraduate information search.

Table 8
Result of ANOVA Test on Study Major and Information Search

| Major | | Sum of Squares | Df | Mean Squares | F | p |
|--------|---------------|----------------|-----|--------------|-------|-------|
| CAS | Between group | 0.631 | 2 | 0.316 | 1.039 | 0.355 |
| COB | Within group | 104.202 | 343 | 0.304 | | |
| COLGIS | Total | 104.833 | 345 | | | |

P < 0.05

I. Study Major and Information Evaluation

The test result between study major and information evaluation is given in Table 9 below. The table shows the result of the study major and information evaluation using the one-way ANOVA test. The result shows that the F value is 6.808 and the p value 0.001 is below 0.05. The result shows that study major affects the way undergraduate students evaluate information retrieval.

Table 9
Result of ANOVA Test on Study Major and Information Evaluation

| Major | | Sum of Squares | Df | Mean Squares | F | p |
|--------|---------------|----------------|-----|--------------|-------|-------|
| CAS | Between group | 4.692 | 2 | 2.346 | 6.808 | 0.001 |
| COB | Within group | 118.197 | 343 | | | |
| COLGIS | Total | 122.889 | 345 | | | |

P < 0.05

J. Study Major and Information Use

The test result between study major and information use is F value is equal to 0.896 and p value is equal to 0.409. p value is higher than the significant value. The result shows that study major does not affect information use.

Table 10
Result of ANOVA Test on Study Major and Information Use

| Year | | Sum of Squares | Df | Mean Squares | F | P |
|-----------------|---------------|----------------|-----|--------------|-------|-------|
| 1 st | Between group | 0.594 | 3 | 0.297 | 0.896 | 0.409 |
| 2 nd | Within group | 113.675 | 343 | 0.331 | | |
| 3 rd | Total | 114.268 | 345 | | | |
| 4 th | | | | | | |

P < 0.05

The ANOVA test result shows that academic factors do not give any impact on information skill. Academic level and study major are not significant in information search [21]. Students regularly used the same search engine. Google is popular amongst students [9] due to the advantages, namely accessibility, ease and it is free [3, 22]. Credibility of the source becomes less. This characteristic may cause academic factors to be affected during information search. Searching for information can be done in different ways depending on a student's background, and also the school's environment plays a role [20, 23, 24, 25].

Table 11
Result of ANOVA Test

| | Information Search | Information Evaluation | Information Use |
|----------------|--------------------|------------------------|-----------------|
| Level of Study | Not significant | Significant | Not Significant |
| Major of Study | Not significant | Significant | Not Significant |

V. CONCLUSION

The study concludes that information-seeking behaviour comprises of information search, information evaluation and information use. The framework was tested using Spearman's Rho and the results showed that there is a significant relationship between information search and information evaluation as well as information use. There is also a significant relationship between information evaluation and information use. The framework can be used for further research related to information-seeking behaviour.

The T-test result shows that personal factors only influence information evaluation but for information search and information use, the result is not significant. The ANOVA analysis revealed that the level of study and study major only influence information evaluation and are not significant to information search and information use.

The findings of this research can be used to improve students' knowledge on information-seeking behaviour and also contribute to the designing of library services such as information skill programmes offered by the university libraries.

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