

Graduate students' online academic information search behaviors in Taiwan

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Abstract: Previous studies have found out that students' search evaluating standards and search strategies play an important role in online information searching. Some studies indicated that there are only few studies discuss about graduate students' online academic information search behaviors. Therefore, this study was conducted to assess these students' online academic information search behaviors including search evaluating standards and search strategies. The interview findings were as a foundation to develop Online Academic Information Search Behaviors (OAISB) inventory, and then to explore the relationships between search evaluating standards and search strategies. The participants in this study included 296 graduate students in Taiwan. Results showed that the students with elaboration higher-level search strategies expressed multiple sources, deep as content, usefulness as technical and accessing as technical. And match lower-level search strategies attempt authority, surface as content, usefulness as technical and accessing as technical. In addition, the regression analyses revealed that graduate students' online academic information search evaluating standards were viewed as predictors to explain their search strategies.

Keywords: Academic information, search evaluating standards, search strategies.

1. Introduction

Searching and using information from different websites has been normally moved into our daily life. There are abundant resources in the online database for users to utilize. Many studies indicated that information searching has become one of the common and frequent online activities in our daily lives (Meneses, Boixados, Valiente, Vivas, & Armayones, 2005). Particularly, students usually look for information on the web to complete their learning tasks during the learning process. Online databases can provide students with more information than traditional books and tools (Lee & Tsai, 2011). Studies also indicated that the Internet has become the primary resource when graduate students and researcher prepare their paper writings (Barrett, 2005; Griffiths & Brophy, 2005; Liu & Yang, 2004). Therefore, to judge the web information is getting more important.

How learners to judge online information has become an important issue. In the process of the information seeking, students may use various types of search strategies to achieve what they desire to complete academic tasks on the Internet (Tsai & Tsai, 2003; Wu & Tsai, 2007). In 2004, Tsai proposed a theoretical framework for web user's information commitments, which included three aspects: standards for accuracy, standards for usefulness, and searching strategy, and also it can be consisted of six factors of representing of information commitments, including "multiple sources as accuracy," "authority as accuracy," "content as usefulness," "technical issues as usefulness," "elaboration as searching strategy," and "match as searching strategy." It was concluded that "Multiple sources," "Content," and "Elaboration" were advanced information commitments, while the others were viewed as less sophisticated by Tsai (2004). However, there is a great deal of academic information on the Internet, so it may become a problem of information over load for researchers. Head (2007) found that graduate students could not find what they need in plenty of relevant academic information in their research fields. The academic information search evaluating standards and search strategies are getting more significant for students. Hence, learner' and researchers' online academic research processes and behaviors have been focused on by many researchers (Du & Evans, 2011).

Literature process could be easily ignored by researchers (Rempel, 2010). Not only for researchers but graduate students, learning how to do search and evaluate literature reviews is an important training process. Yet, as indicated by Boote and Belie (2005), students oftentimes less focused on the literature review process and stressed more on the adoption of methodology and interpretations of gained results. This unbalanced emphasis may not be able to secure the appropriateness of their studies. Nowadays, many studies have found out that students' search strategies and evaluating standards play an important role on literature searching and using (Head, 2007; Ismail & Kareem, 2011). Some studies indicated that there are only few studies discuss about graduate students' academic information seeking behavior (Barrett, 2005; Chu & Law, 2008). Therefore, it is fundamental and quit significant to know what graduate students' literature search evaluating standards and search strategies.

In this study, we attempted to initially understand graduate students' online academic information search behaviors including search evaluating standards and search strategies. Through gathering the interview data from the participants, the results of qualitative analysis could serve as a foundation to develop an inventory, and then gathering questionnaire data randomly from graduate students in Taiwan. Moreover, the relationships between online academic information search evaluating standards and search strategies are investigated.

This study was undertaken to investigate the following research questions:

- Through exploratory factor analyses, could the developed questionnaires in this study, Online Academic Information Search Behaviors, be adequate tools to probe the graduate students' search evaluating standards and search strategies?
- What are the relationships between graduate students' online academic information search evaluating standards and search strategies?
- Through regression analysis, could graduate students' online academic information search evaluating standards be used to make significant predictions about their search strategies?

2. Methodology

Participants

The participants included 296 volunteer students in Taiwan. They were randomly from different universities across various demographic areas in Taiwan. There were 164 male and 132 female students, and they came from different and specific backgrounds including different faculties of the interviewees such as faculty of management, faculty of electrical engineering and computer science, faculty of education and faculty of life science. The age of the students was from 22 to 49 with an average age of 25.18.

Instruments

According to the interview findings to develop the questionnaire, namely Online Academic Information Search Behaviors (OASB) is based on the structure of Information Commitment Survey (ICS) in Wu and Tsai's (2005) study. Wu and Tsai (2005) found six factors of ICS, four factors were search evaluating standards and two categories were search strategies. These served as the foundation for the development of the OASB inventory.

However, according to interview findings, the factors of search evaluating standards were divided from four into six factors, which are "Multiple sources," "Authority," "Deep as content," "Surface as content," "Usefulness as technical" and "Usefulness as accessing." And, the factors of search strategies keep in two the same factors, "Elaboration" and "Match," correspondingly. The total of OASB inventory concluded eight factors including search evaluating standards and search strategies. Four to seven items for each of the six factors of online academic information search evaluating standards were constructed, accordingly. And nine items of each of two factors of academic information search strategies were constructed. Finally, a 52-item, six-factor of evaluating standards and two-factor of search strategies initial version of OASB was established.

The pilot of inventory verification tested the inventory using 296 graduate students, which enabled further examination of the structure, reliability and validity of OASB. Participants were asked

to rate their agreement with the items on a five-point Likert scale (1=strongly disagree to 5=strongly agree). The inventory included the following eight factors, with an interview finding and a sample item for each factor:

- Multiple sources: Students evaluate the correctness of unknown online academic articles by comparing to other websites, printed texts or their prior knowledge.
An interview finding: *...yes, if the content of article is what I have learned before, I think it is right and it is believable.*
A sample item of this factor: If the content matches the knowledge that I have learned, I think the article is correct.
- Authority: Students examine the correctness of unknown online academic article by the “authority” of the websites or sources such as a significant or famous journal.
An interview finding: *...mostly I chose higher significant journal to search articles because the level of journal is been inspected, so that is why it can be trust.*
A sample item of this factor: If the article is accepted by a significant journal (e.g., SSCI; SCI; IEEE), I think it is correct.
- Deep as content: Students evaluate the usefulness of academic articles through the detail content such as the abstract or results.
An interview finding: *...check its input and output... to check is it what I want...the point is the result of the article and its process.*
A sample item of this factor: If the result of the study in the abstract is what I want, I think the article is useful.
- Surface as content: Students evaluate the usefulness of academic articles through the number of citations or downloads.
An interview finding: *...if I have not read the full article yet, I think I will take a look at the number of citations, for example if there are many articles refer to it, it means it is worth to read it.*
A sample item of this factor: If the number of citations of the article is high, I think it is useful.
- Usefulness as technical: Students evaluate the usefulness of academic articles through the ease of online retrieving or searching.
An interview finding: *...on the left side of the database, there are many options we can choose such as education field, engineering field, computer science field etc., we can check one of them and go searching.*
A sample item of this factor: If the database is classified and sorted in a very organized way, I will use it to search for literature.
- Usefulness as Accessing: Students evaluate the usefulness of academic articles through the purposeful ways of obtaining academic articles.
An interview finding: *...the format is the most important thing, like what I said, sometimes when I could not find the PDF, I feel anxious.*
A sample item of this factor: If the format is what I desire (e.g., PDF) when downloading articles, I think the literature in the database is useful.
- Elaboration: Students who have purposeful searching and thinking to integrate academic information from different sources to achieve their purposes.
An interview finding: *...if I found the topic has been doing by many people and their methods are better than mine, I will give up this topic.*
A sample item of this factor: I compare different academic information from relevant academic websites.
- Match: Students who use only few keywords to find a website or just view the first websites which contain the most abundant and relevant academic information.
An interview finding: *... I rely on what the search engine match the keywords I have given, is it match what the keywords I am looking for.*
A sample item of this factor: I just want to find an academic website which has the most useful academic information.

Data analysis

The pilot study used principle component analysis to clarify the factor structure of OAISB respectively. Then the alpha coefficient for each factor of the inventory was calculated to ensure the reliability of

each factor. The Pearson correlation was utilized to explore the relationship between online academic information search evaluating standards and search strategies. Moreover, a stepwise regression model was built by using the categories of search evaluating standards as predictors, and the categories of search strategies were regarded as the outcome variable.

3. Results and Discussion

Factor analysis

OAISB was through gathering the interview data to develop as an inventory for graduate students; hence, this study utilized exploratory factor analysis to examine the factor structure and the reliability of the factor in this new survey. The factor analysis of the OAISB, shown in Table 1, revealed that graduate students' response on the survey were grouped into eight factors (33 items), that is "Multiple sources," "Authority," "Deep as content," "Surface as content," "Usefulness as technical," "Usefulness as accessing," "Elaboration," and "Match." Different from previous studies (e.g. Tsai, 2004; Wu & Tsai, 2005; 2007), the factors were divided from six factors to eight factors that originally "standards for usefulness" were including two factors, "content" and "technical," however, in this study these two factors extended to four factors namely "Deep as content," "Surface as content," "Usefulness as technical," "Usefulness as accessing." These eight factors accounted for 62.54% of the variance. The reliability coefficients (Cronbach's alpha value) for each factor were around 0.64 – 0.89, and the overall alpha was 0.87, suggesting that the internal consistency of OAISB inventory with these eight factors was sufficient for statistical analysis.

Students' scores on the factors

The students' mean scores on each factor of the OAISB is shown in Table 1, all the students' mean scores on each factor were all larger than 3 points on a five-point scale, except of the "Match" (an average of 2.68 per item) factor, which was lower than the theoretical mean of the five-point Likert scale (i.e., 3). The students attained the highest scores on the "Deep as content" factor (an average of 4.03 per item), and followed by the factor "Multiple sources" (an average of 3.91 per item) and the factor "Elaboration" (an average of 3.88 per item). The results imply that graduate students tended to show stronger agreement with higher-level online academic information search behaviors. They attempted to search online academic articles from multiple sources and read details of content as search evaluating standards, in addition, to elaborate the academic information from different web sources.

Table 1: Rotated factor loadings and Cronbach's alpha values for the eight factors of the Online Academic Information Searching Behaviors (n=296).

	Factor 1: MS	Factor 2: AU	Factor 3: CONd	Factor 4: CONs	Factor5: TECHd	Factor6: TECHs	Factor7: ELA	Factor8: MAT
Factor 1 : Multiple Sources (MS), $\alpha=0.64$, mean=3.91, S.D.=0.46								
MS_2	0.58							
MS_3	0.75							
MS_4	0.77							
Factor 2 : Authority (AU), $\alpha=0.89$, mean=3.54, S.D.=0.66								
AU_7		0.70						
AU_8		0.83						
AU_9		0.83						
AU_10		0.84						
AU_11		0.89						
CONd_18		0.54						
Factor 3 : Deep as Content (CONd), $\alpha=0.73$, mean=4.03, S.D.=0.45								
CONd_13			0.63					

CONd_15	0.68	
CONd_16	0.67	
CONd_17	0.72	
Factor 4 : Surface as Content (CONs), $\alpha=0.81$, mean=3.31, S.D.=0.63		
CONs_19	0.66	
CONs_20	0.63	
CONs_21	0.54	
CONs_22	0.77	
CONs_23	0.80	
Factor 5 : Usefulness as Technical (TECHd), $\alpha=0.79$, mean=3.78, S.D.=0.69		
TECHd_26	0.86	
TECHd_27	0.88	
TECHd_28	0.58	
Factor 6 : Usefulness as Accessing (TECHs), $\alpha=0.70$, mean=3.74, S.D.=0.67		
TECHs_32		0.59
TECHs_33		0.76
TECHs_34		0.82
Factor 7 : Elaboration (ELA), $\alpha=0.78$, mean=3.88, S.D.=0.53		
ELA_4		0.65
ELA_6		0.57
ELA_7		0.74
ELA_8		0.79
ELA_9		0.73
Factor 8 : Match (MAT), $\alpha=0.72$, mean=2.68, S.D.=0.69		
MAT_12		0.66
MAT_13		0.74
MAT_15		0.69
MAT_16		0.73

Loadings less than 0.50 were omitted. Overall $\alpha = 0.87$; total variance explained = 62.54%.

Correlation between online academic information search evaluating standards and search strategies

Table 2: The correlation between the factors of the Online Academic Information Search Evaluating Standards and Search Strategies (n=296).

	MS	AU	CONd	CONs	TECHd	TECHs
Elaboration	0.42***	0.11	0.32***	0.09	0.20**	0.26***
Match	-0.14*	0.18**	0.05	0.34***	0.23***	0.13*

***: $p < .001$, **: $p < .01$, *: $p < .05$;

MS: Multiple Sources, AU: Authority, CONd: Deep as Content, CONs: Surface as Content, TECHd: Usefulness as Technical, TECHs: Usefulness as Technical.

The Pearson's correlation was used to reveal the relationships between the factors of search evaluating standards and search strategies. The results are presented in Table 2. It was found that the students with elaboration search strategy tended to express search evaluating standards such as "Multiple sources," "Deep as content," "Usefulness as technical," and "Usefulness as Accessing." On the other hand, the students with match search strategy not tended to possess the "Multiple sources" search evaluating standard, and tended to have search evaluating standards such as "Authority," "Surface as content," "Usefulness as technical," and "Usefulness as accessing." In general, the results showed that the

students' higher-level search strategy as elaboration was associated with higher-level of search evaluating standards such as "Multiple sources," "Deep as content." Meanwhile, lower-level search strategy as match was attempt to have lower-level of search evaluating standards such as "Authority," and "Surface as content." However, both evaluation and match search strategies were expressed technical no matter "Usefulness as technical," or "Usefulness as accessing."

Stepwise regression analysis for predicting students' online academic information search strategies by search evaluating standards

This study conducted a series of stepwise multiple regression analyses to predict students' online academic information search strategies. The students' online academic information search evaluating standards were used as predictors, and their search strategies were outcome for the analyses. The results are shown in Table 3. As a result, the students' online academic information search evaluating standards such as "Multiple Sources," ($t=6.35$, $p<0.001$) "Deep as Content," ($t=3.13$, $p<0.01$) and "Accessing as Technical" ($t=2.78$, $p<0.01$) were significantly positive predictors of higher-level elaboration search strategy. The students' "Multiple Sources," ($t= -3.67$, $p<0.001$) "Surface as Content," ($t=5.61$, $p<0.001$) and "Usefulness as Technical" ($t=3.25$, $p<0.01$) were predictors of lower-level match search strategy.

Based on the analysis of the data in Table 3, it is found that students' higher-level of search evaluating standards (i.e., "Multiple Sources," and "Deep as Content") played an important role in elaboration search strategy. In addition, technical is quite important for both search strategies such as "Elaboration" and "Match." The students' "Technical as accessing," to access academic articles, could predict the higher-level elaboration search strategy. Meanwhile, "Usefulness of technical," through the ease of retrieving academic articles, could predict the lower-level match search strategy.

Table 3: Stepwise regression model of predicting students' online academic information search strategies by search evaluating standards factors (n=296).

OAIS scale	Predictor(s)	B	S.E.	Beta	t	R ²
Elaboration	Multiple Sources	0.39	0.06	0.34	6.35***	0.23
	Deep as Content	0.20	0.07	0.17	3.13**	
	Accessing as Technical	0.12	0.04	0.15	2.78**	
	Constant	1.08	0.30		3.55***	
Match	Multiple Sources	-0.30	0.08	-0.20	-3.67***	0.16
	Surface as Content	0.34	0.06	0.31	5.61***	
	Usefulness as Technical	0.18	0.06	0.18	3.25**	
	Constant	2.03	0.37		5.45***	

***: $p<0.001$, **: $p<0.01$, *: $p<0.05$.

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