The Trends in Information Behavior Research, 2000-2016: The Emergence of New Topical Areas

정보행동에 관한 연구 동향, 2000-2016: 새로운 주제 영역의 부상

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ABSTRACT

Information behavior is an important area of research in library and information science (LIS) that has evolved over the last 75 years. The aim of this study is to investigate the recent trends of information behavior research by providing insights into emerging topical areas within information behavior. To conduct this study, the bibliographic data from *Scopus* was used, and the trends of information behavior were traced by using variations of key terms used in information behavior research, such as "information behavior", "information seeking behavior", and "information needs." In addition, the trends were analyzed in terms of content words in the title, highly cited journal articles, disciplinary categories, and author keywords. Information behavior research has its roots in LIS, but the findings of the study reveal that information behavior has expanded to other disciplines by intersecting a variety of topical areas. In particular, this study showed that information behavior in the health/medicine domain has become a predominant emerging topical area of research. In order to enhance our understanding of complex human behavior, future research should focus more on interdisciplinary aspects by measuring the scope of information behavior.

초 록

정보행동은 문헌정보학 분야에서 75년 이상 동안 발전해온 중요한 연구 영역이다. 이 연구의 목적은 정보행동 내에서 떠오르는 주제 영역에 대한 통찰력을 제공하여 정보행동 연구의 최근 동향을 발견하는 데에 있다. 이 연구를 수행하기 위해 Scopus의 서지 데이터를 사용하였고 "information behavior" (정보행동), "information seeking behavior" (정보추구행동), 그리고 "information needs" (정보 필요성) 등의 정보 행동 연구에서 흔히 사용하는 주요 용어를 이용하여 정보행동의 경향을 살펴보았다. 또한 제목의 내용 단어, 많이 인용된 논문, 주제 분야 및 저자 키워드를 사용하여 동향을 분석하였다. 정보 행동 연구는 문헌정보학에 뿌리를 두고 있지만, 그 결과는 다양한 주제 영역과 교차하여 정보행동이 다른 분야로 확장되었다는 결과를 보여주었다. 특히 정보행동 연구는 건강 / 의학 분야에 적용되어 주요 주제로 부상되고 있음을 보여주었다. 다양한 정보행동에 대한 이해를 높이기 위해서 추후 연구에서는 정보행동의 융합적인 측면과 융합적인 범위를 조사하는데 더 중점을 두어야 할 것이다.

Keywords: Research Trends, Bibliometrics, Information Behavior, Information Seeking Behavior, Information Needs, Health Information Behavior, Interdisciplinarity
연구 동향, 계량서지학, 정보행동, 정보추구행동, 정보 필요성, 건강 정보행동, 융합

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1. Introduction

Information behavior has been regarded as a core area of research in Library and Information Science (LIS). Information behavior is a term used to describe ways in which human beings interact, seek, and utilize information (Bates 2010). Information behavior research has more than 75 years of history and has been evolving with each passing year. Since its inception, researchers have continuously endeavored to find new areas of information behavior research.

Traditionally, information behavior research often tended to focus on a specific group of individuals and subject areas as the notion of information behavior could be applied to a variety of contexts (Case 2016, p. 47; Sonnenwald 1999). Context refers to the state of an individual person and the background where the individual is embedded (Gaston 2017). Context can be multi-dimensional (Dervin 1997) and differ from one individual's situation to another (Courtright 2007). Due to the differing types of contexts, the potential research topics related to information behavior can be enormous. Partially because of this reason, information behavior research, as a whole, has grown rapidly until recently. Although previous works, such as Julien, Pecoskie and Reed (2011), empirically examined the current state of information behavior research, the extent of emerging topical areas in information behavior research has not yet been investigated to a satisfactory degree.

The aim of this study is to investigate the recent trends of information behavior research. In particular, this study focuses on finding the emerging topical areas and sheds lights on new possible topics for information behavior research. Unlike previous studies, this study utilizes a bibliometric approach using the *Scopus* database in order to quantify a variety of journal publications. In this study, current information behavior research is characterized by examining author keywords, titles, disciplinary categories, and highly cited journals.

2. Related Works

Since the inception of information behavior, researchers have produced a plethora of research works related to information behavior, ranging from theoretical perspectives to practical research. The point of maturity in information behavior research is likely to have reached when Wilson (1997) comprehensively reviewed many models of human information behavior. Wilson (2000) then provided a general model of information behavior that incorporated numerous elements that are often discussed outside of LIS, emphasizing the interdisciplinarity of information behavior research. To this end, Wilson's information behavior model offered a universal framework that could be used to comprehend complex human behavior that arises from interaction with information sources regardless of the specific context in which information behavior was investigated. In this sense, he offered an intuitive understanding of complex universal human phenomenon in relation to information sources.

In the rest of this section, we will focus our efforts

on providing research done after Wilson's general model of human information behavior (2000). In particular, we will review previous research that has attempted to reflect upon the evolution of information behavior.

González-Teruel et al. (2015) showed a trend of information behavior by using a bibliometric and network analysis. Using the Web of Science (WoS) database, the authors examined articles printed in publications indexed by Social Science Citation Index (SSCI) and Conference Proceedings Citation Index (CPCI) in the years between 2000 and 2012. In particular, the authors utilized authorship and co-authorship of information behavior to find the trends of information behavior. The authors pointed out that information behavior research has been led by a few prominent investigators such as Spink, Belkin and Marchionini. Yet, the authors also suggested that a wide range of groups of researchers, to a lesser degree, had been contributing to the development of information behavior research.

Julien, Pecoskie and Reed (2011) conducted a content analysis of 749 articles published on information behavior from 1999 to 2008. The authors analyzed the articles based on variables such as authorship, article type, interdisciplinarity, research methods, and journal type. The authors pointed out information behavior research on the following user groups: students (19.4%; n=145), professionals (9.6%; n=72), scholars (7.9%; n=59), the general public (7.1%; n=53), non-professional employees at a workplace (2.3%; n=17), and other specific groups such as library users and Web users (32.4%; n=243). Their findings revealed that researchers often use students, library users, and web users as the focal target of research. In particular, Julien, Pecoskie and Reed (2001) argued that information behavior shows interdisciplinary characteristics, as the researchers who publish articles on information behavior increasingly cite articles outside of LIS.

Greifeneder (2014) examined the trends of information behavior by analyzing 2 years of published works in *Journal of the Association for Information Science and Technology, Information Research, the Journal of Documentation, and the iConference Proceedings*. The author demonstrated the importance of taking user's context into account in information behavior research. In the author's research, qualitative methods still dominated information behavior research and information seeking still was the major topic. The author argued that recent information behavior research generally focuses on specific context and does not necessarily fit into the traditional models.

Parmar, Kumar and Prakash (2008) conducted a study on information seeking behavior based on 864 publications from *LISA Plus*. Besides showing the chronological growth of publications from 1967 to 2001, the authors showed collaboration patterns, most contributed authors, languages in which maximum number of articles are published, and types of publications. The authors also demonstrated the most frequent subject keywords along with their number of occurrence in the documents. In particular, the authors examined some essential keywords related to information behavior: 'information seeking behavior' including 'searching' (66), 'online information

retrieval' (59), and 'information storage and retrieval' (48). Their study demonstrated the benefits of utilizing essential keywords in probing the trends of information behavior research.

Vakkari (2008) investigated theoretical and methodological trends in information behavior research using a content analysis of the *ISIC 1996* and *ISIC 2008 Conference* proceedings. The author pointed out that there had been a declining trend of theoretical, explanatory and quantitative studies. The author categorized theoretical coupling into three categories: 'strong connection', 'medium connection' and 'loose connection'. The author pointed out that theoretical coupling of information behavior became more loose starting from 1996. At the same time, information behavior research tends to be more descriptive and qualitative, according to the author. The author also pointed out that a growing number of studies examined behavior in a user's natural environment and studied the user's contexts.

In sum, previous research pointed out that information behavior research often tends to focus its efforts on the context of information behavior. In turn, partially due to a variety of possible context of information behavior, information behavior research has continuously been growing. Considering the growth of literature on information behavior, this study adapted a bibliometric approach for analyzing information behavior using the *Scopus* database, which provides a large bibliographic data on information behavior research. In this study, some recent trends of information behavior research were investigated with the goal of identifying some emerging topical areas.

3. Data and Methods

A bibliometric approach, along with analytical approach, was used in conducting this study, which investigated the extent of information behavior research. For this purpose, this study relied on using the *Scopus* database. As one of the largest bibliometric databases in the world, *Scopus* database indexes prominent LIS journals and excludes journals that do not meet international standards. In order to conduct this study, first relevant query terms were selected. Considering the basic notions relevant to information behavior, the following terms were initially selected:

- "information behavior",
- "information use behavior",
- "information searching behavior",
- "information seeking behavior", and
- "information needs."

Some key terminologies related to information behavior are provided by Wilson (2000). He first provided three fundamental types of information behavior which are *information searching behavior, information seeking behavior*, and *information use behavior*. Wilson defined *information seeking behavior* as behavior that is associated with the purposeful act of finding information in an attempt to satisfy one's information needs. He defined *information*

searching behavior as a behavior associated with interaction with information systems in an attempt to find information, and *information use behavior* as behavior that is associated with utilization of information in an attempt to advance one's knowledge.

Another closely related term frequently appearing in information behavior literature is *information needs*. Information needs are often used to describe the needs of information pertaining to a group of people. Although information need deals with a psychological need rather than observable behavior, the concept of *information need* is often loosely used under the umbrella research area of information behavior. Collectively, such fundamental terms provide frameworks for understanding the concept of information behavior and provide a basis for developing general information behavior models that depict core aspects of observable human behavior in relation to information sources.

Thus considering the notable terms provided by Wilson (2000), these terms were used as initial search queries to obtain relevant journal articles on information behavior. The search criterion was further constrained by specific year (i.e., 2000-2016) and the document type (i.e., article). The query selection could be formulated using advanced *Scopus* query. For instance, the search term "information behavior" was expressed as the following:

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TITLE( "information behavior" ) AND
( LIMIT-TO ( SRCTYPE, "j" ) ) AND
( LIMIT-TO ( DOCTYPE, "ar" ) ) AND
( LIMIT-TO ( PUBYEAR, 2016 ) OR
LIMIT-TO ( PUBYEAR, 2015 ) OR
LIMIT-TO ( PUBYEAR, 2014 ) OR
LIMIT-TO ( PUBYEAR, 2013 ) OR
LIMIT-TO ( PUBYEAR, 2012 ) OR
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LIMIT-TO ( PUBYEAR, 2000 ) )
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Similarly, the pertinent data were retrieved using the rest of the queries, which are "information use behavior", "information searching behavior", "Information seeking behavior", and "information needs." The matched search results were normalized to lower case letters and punctuations were removed. More specific procedures are required occasionally, and these types of procedures are described along with the results.

4. Results

4.1 Growth of Journal Articles on Information Behavior

As mentioned earlier in the introduction section, three fundamental aspects of information behavior include key concepts such as information searching behavior, information seeking behavior, information need, and information use behavior. Table 1 shows

the frequency count of journal article titles containing the terms related to information behavior. As shown, the term with the highest frequency count in this list is "information need" (1049), and the term with the second highest frequent count is "information seeking behavior" (449). Since these two terms are used more frequently in information behavior research as compared to other terms, the matched search results suggest that researchers mostly focus on information seeking and information need in information behavior research. On the other hand, examples of terms with fewer number of matched results are "information searching behavior" (11) and "information use behavior" (2).

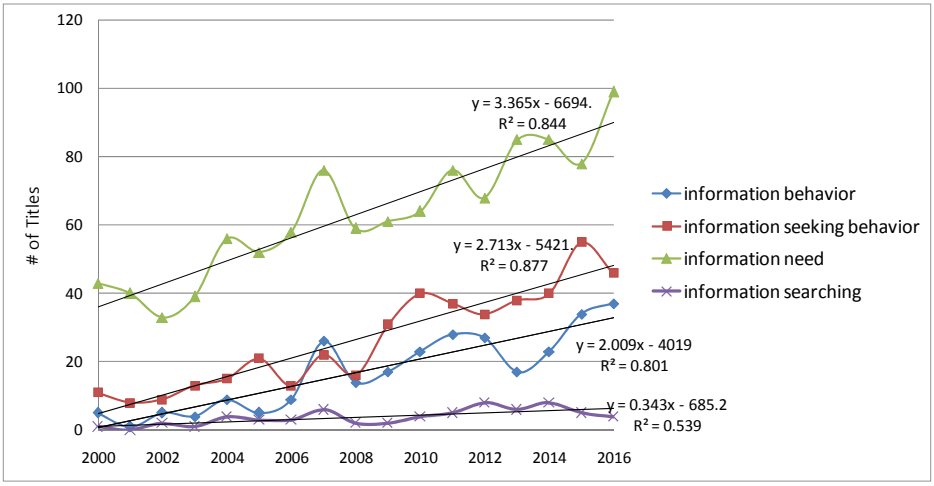
A possible explanation of this low number of matched results was provided by Vakkari (2008). The author pointed out that the topic of information use might have already existed, but in the form of differing name. Vakkari argued that the usability study conducted in a digital library is an example of information behavior research, which does not actually use the term "information use." In addition to the Vakkari's explanation, we need to consider the fact that the term "information literacy" is also commonly used nowadays. Information literacy refers to the ability to search for, select, critically evaluate and use information for solving problems in various contexts (Limberg, Sundin and Talja 2013). Although the definitions are different from each other, information literacy can be viewed as a notion that can include the notion of "information use." For this reason, information behavior research that does not make a strong connection to the previous works in information behavior research may use information literacy in place of "information use."

〈Table 1〉 Frequency Count of Matching Journal Titles

Search queries	Frequency
information behavior	284
information seeking behavior	449
information searching (search) behavior	64
information use behavior	2
information need(s)	1072

On a side note, some variations of spelling in the key terms were handled automatically by the *Scopus* database. For instance, the search query that contains the word "behavior" also retrieved the records that contain "behaviour" due to its spelling difference. Similarly, the search query that contains the word "need" also retrieved the records that contain "needs."

Figure 1 depicts the growth of journal articles on information behavior. Considering the low frequency count of the search query "information use behavior", only other four search queries on information behavior were selected. In this figure, the slope of each search query – "information need" (3.36), "information seeking behavior" (2.713), "information behavior" (3.365), and "information searching (search) behavior" (0.343) – is shown. The search result shows that all article titles that contain the information behavior steadily increased from 2000 to 2016. Even so, the growth rate of article titles that contain the terms "information searching (search) behavior" is relatively minimal.



〈Figure 1〉 Yearly Trend of Journal Articles on Information Behavior

On the other hand, "information seeking" is higher than the growth rate of article titles containing other information behavior related terms. For all three terms related to information behavior, the growth rate moderately appears along the fitted line (R^2 > .80). Using this simple regression model, it is reasonable to predict that information behavior research is likely to grow steadily in the coming decade – particularly article titles that contain information behavior, information seeking behavior, and information needs.

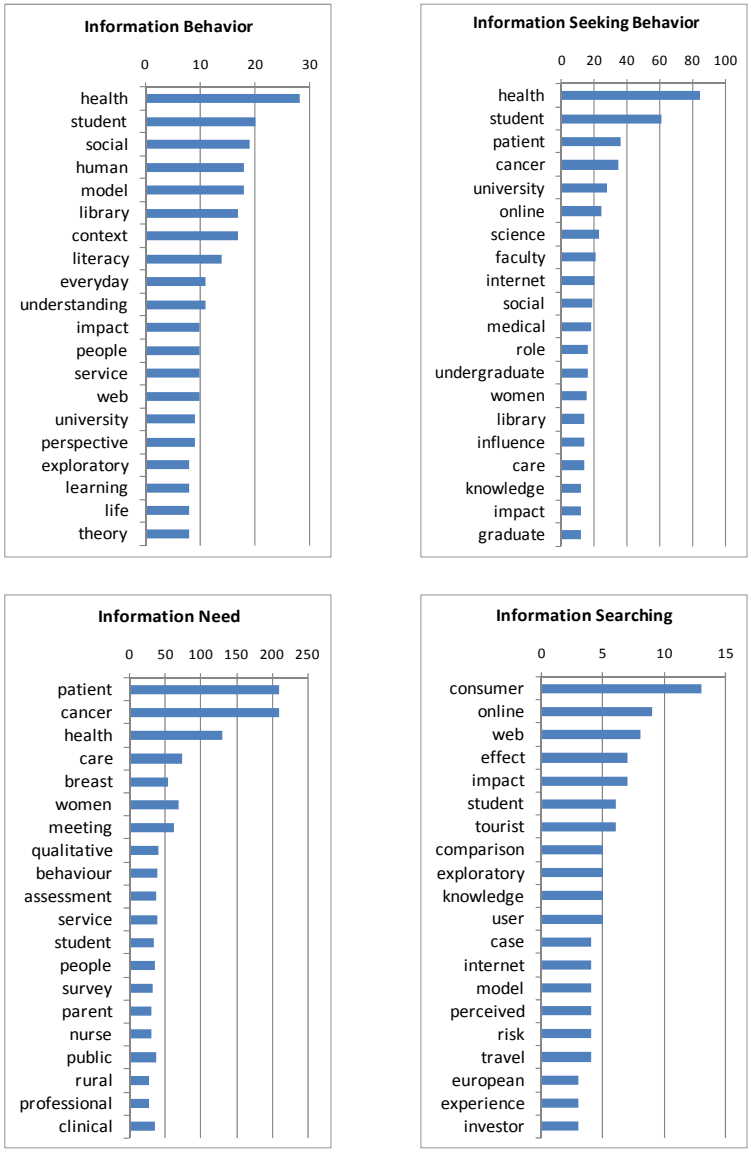
4.2 Frequently Used Content Words in the Title Field

The words in the titles related to information behavior provide some clues to the current state of information behavior research. However, not all words in the title offer the same type of information. In order to obtain a general sense of common contexts used in information behavior research, it is advantageous to detect the content words. Content words provide some clues for understanding the concept and ideas, whereas function words connect content words by forming phrases, clauses, sentences and paragraphs (Katz 1996). In this study, the content words allow us to obtain a sense of common topical areas and context of the research. To view the content words, the title field was first searched using search queries related to information behavior. Then, the frequency counts of all words that appear in the title was obtained. After this step, punctuations in the words were normalized, and words that had low content values were removed. These include:

- Common words used in the title that referred to non-specific, general method (e.g., Analysis),
- Function words such as propositions (e.g., "on") and articles (e.g., "the"),
- Adjectives and adverbs that describe another noun (e.g., "highly"), and

• The search terms that appear in the search queries (e.g., “behavior”).

Figure 2 shows the top 20 content words that appear in the titles under the topic of information behavior. To generate this list of words, four search queries related to information behavior – “information behavior”, “information seeking behavior”, “information needs”, and “information searching (search)” – were used to search in the *Scopus* database. Note that the



〈Figure 2〉 Top 20 Content Words in the Title Field

x-axis shown on the top of each graph refers to the number of content words. From this, we can see that there is great disparity among the graphics in terms of the number of content words. As shown, there are more titles that matched the search query "information need" than any other search queries. In general, the content words display a variety of topical areas that are associated with each information behavior related aspect. Except for the content words that are associated with "information searching (search)", substantial number of keywords in this figure refer to the health/medicine related aspects. Thus highly frequent keywords in this figure indicate the popularity of health/medicine topical area in information behavior research.

4.3 Author Keywords on Information Behavior Research

The author keywords can be used to gain insights into some of the points made by previous research. The current state of information behavior research can be examined by grouping author keywords and analyzing them. This also helps in identifying various topical areas of information behavior research.

Table 2 shows the top 20 frequently used keywords in information behavior. In this table, author keywords of "information searching (search)" were not

〈Table 2〉 The Top 20 Author Keywords in Information Behavior Articles

	Information Behavior		Information Seeking Behavior		Information Need	
rank	freq	keywords	freq	keywords	freq	keywords
1	7	information retrieval	31	internet	31	breast cancer
2	6	user studies	12	information sources	30	cancer
3	6	students	12	information retrieval	24	patient education
4	6	information use	12	health information	24	decision making
5	6	academic libraries	11	information services	21	education
6	5	research	11	cancer	18	qualitative research
7	5	public libraries	9	user studies	18	communication
8	5	personality	9	students	17	internet
9	5	information sources	9	consumer health information	17	information sources
10	5	information science	8	information literacy	13	user studies
11	5	information research	8	health literacy	13	consumer health information
12	4	qualitative research	7	information research	12	nigeria
13	4	learning	6	survey	12	needs assessment
14	4	internet	6	health information seeking	12	information retrieval
15	4	information services	6	academic libraries	12	focus groups
16	3	Women	5	patients	11	rehabilitation
17	3	twitter	5	nigeria	11	cancer patients
18	3	social media	5	knowledge	10	students
19	3	research methods	5	Greece	10	nursing
20	3	methodology	5	graduate students	10	information services

included due to the relatively low number of retrieved results, and author keywords of three other types of information behavior search queries are shown. All author keywords in this list were normalized to lower case letters before performing the frequency count. There are some differences among the keywords found in all the search queries on information behavior. In information seeking behavior, the health/medicine related keywords and the university related keywords can be also noticed. Terms related to health/medicine disciplines can also be found under the "Information Need" column. From this table, we can observe some emerging information behavior related topical areas:

- Technology/internet (e.g., internet, twitter),
- Education (e.g., information literacy),
- Health/medicine (e.g., Cancer),
- Group of individuals (e.g., student), and
- Research (e.g., qualitative, study, user studies)

The above topical areas are determined by qualitatively classifying the keywords in this table. Note that topical areas can be problematic as topical areas are not all discrete and require judgment calls in classifying the keywords into the topical area. Although the precise extent of each topical areas was not estimated, additional analysis procedures described in the rest of the article provide a clearer picture of emerging topical areas in information behavior research.

In contrast to whole author keywords, only adjectives of author keywords were extracted in order to examine some aspects of information behavior research. Adjectives that describe "information behavior" often reveal some characteristics of "information behavior" research. To extract only adjectives, the author keywords that contain the word "information" were first compiled from the journal article data, and then some less relevant function words were removed. Rather than extracting adjectives of "information behavior", only the word "information" was used in order to perform a less restrictive search. Since the word that preceded "information behavior" did not produce many results, the search was broadened by using the adjective that precedes the word "information." Although the term that precedes the word "information" might not be the adjective that describes information behavior, the approach was adequate for the purpose of identifying potential adjectives based on the existing titles.

Table 3 shows a complete list of adjectives containing the term "information" in the title or in the author keywords. In this table, greater number of adjective terms can be grouped with health/medicine subject area due to their close relations. Also, this table demonstrates that some adjectives that describe "information" often reference technology (e.g., electronic, internet, online, mobile, and web). It should be noted that information behavior in reference to the technology context is not a recent idea. For example, information behavior in an electronic environment had been provided in Marchionini (1997), which was two decades ago. Yet, this list of adjectives suggests that information behavior in an electronic environment might still be a relevant issue among some

〈Table 3〉 Extracted Adjectives Describing the Word "Information"

academic	discharge	health[1]	medical practice[1]	pharmaceutical[1]
agricultural	disease[1]	healthcare[1]	medication[1]	processing
automated	disposable	hospital[1]	medicines[1]	real time passenger
breast cancer[1]	domain specific	human	mobile[2]	recycling
business	drug[1]	informal help	multicultural health[1]	scholarly
cancer[1]	electronic health[1]	inhouse	multilingual health[1]	sexual health[1]
careers	electronic[2]	intellectual capital	music	social
children	everyday	interactive	musical	sports
clinical[1]	everyday life	internet based health[1,2]	nontraditional medical[1]	stakeholder
collaborative	evidence based	internet health[1,2]	nutrition[1]	stroke[1]
community	fertility[1]	investor	online health[1,2]	web[2]
complex	food	leisure	online[2]	website[2]
consumer health[1]	formal help	lung[1]	parental	
consumer	geographic	managerial	patient[1]	
covert	geospatial	marketing	Perceived	
cross language	hazard	medical[1]	personal	

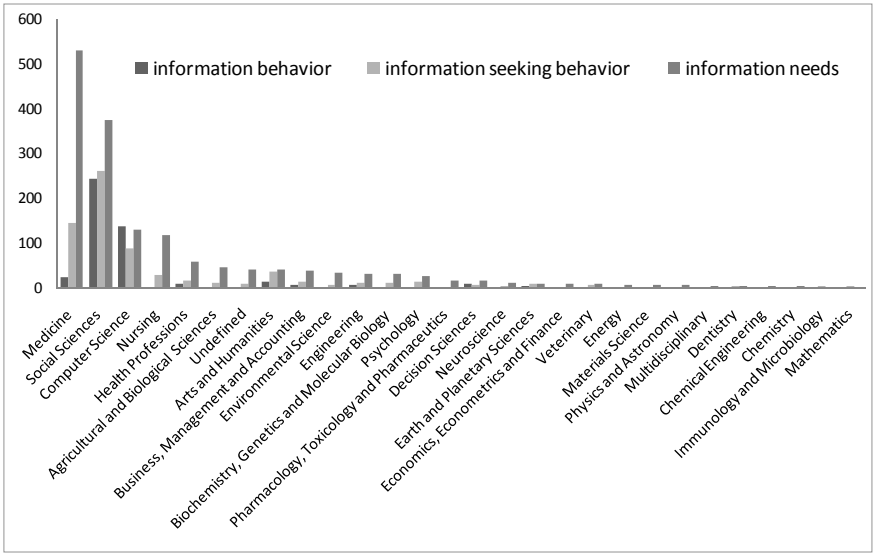
Note: The category [1] refers to health/medicine, and category [2] refers to technology/internet

researchers. As shown, some content words refer to both health/medicine and technology/internet. Still, collectively, we can notice that adjectives that refer to the health/medicine are most common

4.4 Disciplinary Categories of Information Behavior Research

The extent of disciplinarily can be assessed by examining disciplinary categories of journals that published information behavior journal articles. In *Scopus* database, all journals are automatically categorized using the *Scopus* pre-defined disciplinary categories. Using these disciplinary categories, the total occurrences of journal article titles that contain the three search queries related to "information behavior" are depicted in Figure 3. As shown in this figure, information behavior research is associated with diverse disciplinary categories.

In this figure, *Medicine* is the top most disciplinary category with journal article titles that contain the search queries related to "information behavior." However, there are some differences among the disciplinary categories of searched results. In *Medicine*, the matching results of the searching query "information behavior" are relatively low in comparison to the matched search results of "information seeking behavior" and "information needs." Consequentially, this figure suggests that the term "information behavior" is not frequently used in some fields, such as *Medicine*. In *Social Sciences*, the number of retrieved article titles using all three search queries of information behavior is less than the number of retrieved article titles using "information behavior" as a search query. Note that since there is no separate disciplinary category available for LIS in *Scopus*,



〈Figure 3〉 Relevant Disciplines of Information Behavior Articles

all LIS journals would be categorized in closely related disciplinary categories, such as *Social Sciences*. In contrast to *Medicine*, in *Social Sciences* and *Computer Sciences*, the article titles received are more evenly distributed among the three search queries related to information behavior.

4.5 Highly Cited Journal Articles

In order to assess the trends of information behavior research, the type of influential information behavior research needs to be examined. For this purpose, highly cited journal articles concerning information behavior research published during 2000 to 2016 were retrieved using all search terms related to information behavior. Table 4 shows the top 10 journal articles that received high number of citations at the time of conducting the research. All articles shown here received more than 150 citations at the time of conducting this study. As a side note, since the number of citations is dynamic, articles in *Scopus* database are likely to receive more citations as time passes.

Some emerging patterns in terms of topical areas can be noticed from the top 10 highest receiving articles. An article written by Leydon et al. (2000), which focuses on cancer patient's information needs and information seeking behavior, received the highest number of citations in the journal articles (520 times). The authors of this article used a qualitative approach in exploring a specific group of individuals, who are cancer patients. It should be noted from the literature review section that Greifeneder (2014) and Vakkari (2008) pointed out the increasing use of qualitative approach in information behavior research. The third highest receiving article, Wilson (2000), provided a brief holistic perspective of issues

〈Table 4〉 Top 10 Cited Articles of Information Behavior

	Authors	Title of Journal Article	Journal Name	Citation Received
1	Leydon et al. (2000)	Cancer patients' **information needs** and **information seeking behaviour**: In depth interview study	*British Medical Journal*	520
2	Jenkins et al. (2001)	**Information needs** of patients with cancer: Results from a large study in UK cancer centres	*British Journal of Cancer*	514
3	Wilson (2000)	Human **information behavior**	*Informing Science*	494
4	Gray et al. (2005)	Health **information-seeking behaviour** in adolescence: The place of the internet	*Social Science and Medicine*	337
5	Gursoy and McCleary (2004)	An integrative model of tourists' **information search behavior**	*Annals of Tourism research*	234
6	Rees and Bath (2000)	The **information needs** and source preferences of women with breast cancer and their family members: A review of the literature published between 1988 and 1998	*Journal of Advanced Nursing*	172
7	Weiler (2005)	**Information-seeking behavior** in Generation Y students: Motivation, critical thinking, and learning theory	*Journal of Academic Librarianship*	167
8	Hoagland (2002)	The economic effects of harmful algal blooms in the United States: Estimates, assessment issues, and **information needs**	*Estuaries*	163
9	Davies (2007)	The **information-seeking behaviour** of doctors: A review of the evidence	*Health Information and Libraries Journal*	162
10	Thewes (2005)	Fertility- and menopause-related **information needs** of younger women with a diagnosis of early breast cancer	*Journal of Clinical Oncology*	158

Note: Search queries that are matched in the journal titles are shown in bold.

and approaches in information behavior. It is the most frequently cited article that is published in a LIS journal. An article written by Gray et al. (2005), which deals with information seeking behavior of adolescence in the context of internet, received the 4th highest number of citations (337 times). It was published in *Social Science and Medicine*, which is an interdisciplinary journal that overlaps between the discipline of Social Science and Medicine. As a whole, the most interesting aspect of the journals receiving high citations is that more than half the journals that contain the top 10 most cited articles from health/medicine areas.

As far as the methodological approach is concerned, a variety types of articles can be noticed, ranging from qualitative approach to theoretical approach. In Table 4, there are two articles that address theoretical models of information behavior – Wilson (2000) and Gursoy and McCleary (2004). It should be noted that these two articles contain the terms "information behavior" and "information searching (search) behavior." This minor difference perhaps is an indication that the terms "information seeking" and "information needs" are associated with theoretical aspects of information behavior to a lesser degree than the terms "information behavior" and "information searching (search) behavior."

5. Discussion and Conclusion

The trends of information behavior were analyzed in terms of content words in the title, highly cited journal articles, disciplinary categories, and author keywords. Considering the detailed results of this study, a holistic qualitative assessment could be made regarding the recent trends of information behavior research. Overall, information behavior research has been growing rapidly in recent years, particularly works that contain the title terms “information needs” and “information seeking.” Since the usage and context in which these terms are used are different, the varying degree of growth was expected. Despite the continuous growth of information behavior research over the past decade, we can expect more growth in the research output in the future.

In essence, this study confirmed some previous findings on the trends of information behavior. The author keywords showed a wide range of topical areas, such as technology/internet, education, health/ medicine, group of individuals, and research study. In particular, this research pointed out that information behavior research has expanded outside of LIS. We pointed out that the information behavior research is particularly blooming in the area of health/medicine. The evidence of the expansion to health/medicine area is the following: (a) The content words in the title depict many health/medicine related topics are addressed in the information behavior research, suggesting that the health/medicine areas have become the most notable topical areas of information behavior research. (b) The disciplinary categories provided by *Scopus* and highly cited articles showed that information behavior currently is highly interdisciplinary, particularly in the areas of health/medicine. (c) Articles that received a higher number of citations are most frequently published in health/medicine journals.

In a macro perspective, the trends of information behavior research appear to reflect typical research areas in LIS. That is, as an interdisciplinary discipline, LIS has more increasingly crossed boundaries of other disciplines over the years. In particular, the fact that LIS intersects the health/medicine discipline suggests that future information behavior research may require more domain knowledge and disciplinary background from potential researchers. As in the case of health information science, the health/medicine information behavior area has been an attractive area of information behavior research. Other topical areas of information behavior research may show more interdisciplinary trends in the future. From a LIS perspective, due to a plethora of information behavior research with varying contexts, such information behavior research with a particular context may seem less interesting. Thus, due to divergent disciplinary views, we may see even more interdisciplinary information behavior research regardless of how academics in LIS view the value of information behavior research published outside of LIS.

This study provided some empirical evidence to find the emerging topical areas within information. Considering the limitations of the approach used in this study, further research could be conducted in order to investigate the trends of information behavior research. First, this study used articles present in *Scopus*

database as a source for bibliographic database. The future research can include other types of journal databases since *Scopus* do not cover all publications. This will likely confirm the findings of this study by providing additional details on emerging topics of information behavior research. In particular, in investigating the information behavior research in health/medicine using other types of bibliographic database, such as *Pubmed* (https://www.ncbi.nlm.nih.gov/pubmed/), should be considered.

Second, evolving theoretical aspects of information behavior need to be investigated further. Because of expansion into other disciplinary areas, there could be a rise of information behavior research due to the loose framework as suggested by Vakkari (2008). Taking this notion one step further, the extent of theoretical coupling could be examined in conjunction with various disciplines. In this manner, we are able to examine the extent of cross-disciplinary theoretical coupling with regards to information behavior research. For this purpose, citation network analysis that exhibits interdisciplinarity could become a part of assessing the theoretical coupling.

Third, future research can provide an updated research on evolving theoretical aspects of information behavior research models and frameworks. A general model of information model by Wilson (2000) and integrative framework by Spink and Cole (2006) emphasize diverse perspectives of information behavior. The important question can be raised as to the following: *What type of improvement can be made in regards to the earlier theoretical information behavior models?* Although such models emphasize integration of diverse aspects of information behavior, applicability of these models outside of LIS research is not clear. We presume that information behavior research published outside of LIS is more pragmatic in general and the theoretical discussion on information behavior might be viewed as a beyond scope of their research focus. However, extending the general type of information behavior models for specific discipline might be worth pursuing. A similar point was made by Marton and Choo (2011). The authors argued that multidisciplinary frameworks are needed in order to examine the complexity of online health information behavior. Thus, such multidisciplinary frameworks and models of information behavior should be investigated further in the future.

Finally, future studies can focus on classifying the contexts and investigate the extent of current research in respect to the context. This study provided a glimpse of contexts by focusing on topical areas as the notion of individual context is narrower than the topical area. With the growth of information behavior research, multi-dimensional classification of contexts could be developed.

In conclusion, in assessing trends of information behavior research, more specific interdisciplinary aspects of information behavior need to be investigated in the future. In spite of finding some interdisciplinary trends in information behavior research, this study did not comprehensively examine interdisciplinary aspects of information behavior. That is, without oversimplifying the notion of interdisciplinarity, various indicators of interdisciplinarity and the extent of interdisciplinarity in information behavior research

could be investigated. This will enable us to measure the scope of interdisciplinarity of information behavior research. Likewise, it can be further modified to measure the scope of interdisciplinarity that arises in other subareas of LIS. For such purposes, additional analysis techniques could be employed, including co-word analysis, citation analysis, and co-citation analysis. Such an effort to measure the interdisciplinarity of information behavior using the above- mentioned analysis techniques can provide a better understanding of the complex nature of human information behavior and the emerging topical areas of information behavior research.

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