



The influence of Taylor's paper, *Question-Negotiation and Information-Seeking in Libraries*



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ABSTRACT

This study uses bibliometric analysis and citation context analysis to identify the influence of the main concepts embedded in Taylor's 1968 classic article entitled *Question-Negotiation and Information-Seeking in Libraries*. This study analyses articles published between 1969 and 2010 which cite Taylor's article. The results show that Taylor's article on a question-negotiation model is increasingly visible and its influence is not limited to the discipline of library and information science. Of the 14 cited concepts identified, the concept of "four levels of information needs" was cited most (31.7%), followed by "question negotiation" (20.5%) and "other concepts relating to information needs" (17.9%). The results indicate an increasing trend in the citations of "four levels of information needs" and this concept also received the most attention from information retrieval research. A decreasing trend was evident for the concept of "question negotiation" and this concept was frequently cited by reference service researchers. In addition, among the 10 citation functions, "related literature" was dominant (30.8%). Both "evidence" and "views" were in second place with the same percentage (18.7%), followed by "terms" (9.2%) and "background information" (7.2%). A decreasing trend was identified in the top three citation functions, whereas an increasing trend was observed in the "term" and "background information" functions.

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1. Introduction

When people cannot solve problems using their knowledge, they usually seek information to fill this knowledge gap (Belkin, Oddy, & Brooks, 1982). A library is one of many information channels available to inquirers. Historically, libraries attempt to understand user information requirements and how users seek and use information to increase user access to desired information. This is why human information behavior has been studied in the field of library and information science (LIS) since the early nineteenth century (Wang, 2011).

Research on information behavior is multidisciplinary and focuses on the interaction between users and information. Of the many topics related to information behavior, LIS researchers have mainly focused on information seeking and information use. Two major information behavior research perspectives dominated during different periods. Before the late 1970s, the system-centered view was dominant. This view treats information as a valuable resource that can resolve user uncertainty. Hence, libraries should provide large databases and improve system functions and interfaces to increase user access to information. However, better retrieval systems did not reduce user information problems. By the 1980s, the user-centered

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view—which focuses on user needs and acknowledges that user needs may change according to different contexts—emerged and became dominant (Wilson, 2000).

During the transition from the system-oriented view to the user-oriented view, Taylor pioneered user needs. He published an article called *Question-Negotiation and Information Seeking in Libraries* in 1968 which developed the question-negotiation model based on interviews with reference librarians. Taylor (1962, 1968) identified four levels of information needs: visceral, conscious, formalized, and compromised. These levels were first introduced in *The Process of Asking Questions* (Taylor, 1962). Visceral need is an actual, yet unexpressed information need because inquirers are not conscious of any information needs. The conscious need indicates that inquirers consciously realize their information need. When inquirers can express their information need, they are in the formalized need level. Finally, the question of the inquirer must be adapted to the information system.

The four levels of information needs also explain the process of question formation. Each information need level corresponds to questions with different characteristics. Usually, inquirers cannot express their real information needs to access relevant resources. Therefore, reference librarians attempt to assist inquirers by clarifying information problems through reference interviews. The reference interview is a process of question negotiation where reference librarians communicate with inquirers, and emphasizes the importance of interaction. Reference interviews assist inquirers in determining their actual information needs and subsequently build bridges between inquirers and available resources. To achieve successful question negotiation, Taylor (1968) suggested that reference librarians extract five types of information from the process, including the subject of the question, the motivation of the inquirer, personal characteristics, anticipated or accepted answers, and the relationship between the question and available resources.

Although Taylor's question-negotiation model was developed using a limited number of librarian interviews, it was highly valued because it was the first study to develop the reference interview process. The question-negotiation model has become a practical guide for reference interviews and has affected other information behavior theories (Edward, 2005; Nicolaisen, 2009). Taylor's work is regarded as the foundation for understanding the psychological changes in information needs and user-oriented approaches to information retrieval studies (Bruce, 2005; Fidel, Pejtersen, Cleal, & Bruce, 2004; Xie, 2008). Taylor indicated that information needs may be unconscious and inexpressible. He also indicated that his 1968 article received attention because it helps with understanding the human–system interface in libraries and other information systems (Taylor, 1985). This indicates that the contribution of Taylor's (1968) article on the question-negotiation model is not limited to reference services. Taylor's user-oriented perspectives on users and information systems have also inspired related studies. Pikas (2007) indicated that Taylor's article has influenced the education of information specialists, the design of information systems, and the advancement of related studies.

The influence of a publication can be measured by counting its citation frequency. Bibliometrics state that the more an article is cited, the greater its influence. Influence represents visibility. When a publication is frequently cited, it indicates that it has been read by several authors. The citation frequency can be used to determine the importance of a publication, although it is controversial. Regarding citation frequency, a preliminary search of the Web of Science (WoS) database shows that Taylor's question-negotiation article was first cited in 1969 and has been cited every year since. This indicates that it remains an influential article. However, this does not indicate which content from the cited article is most influential nor does it show the relationship between citing and cited articles. Citation context analysis can be used to measure these variables. Citation context analysis is a content analysis method used by researchers to analyze cited concepts and reasons for citation based on the text surrounding in-text citations (Small, 1978).

To examine the influence of Taylor's article, this paper uses a bibliometric method to analyze citation frequency trends, the distribution of citations among disciplines, and the research topics of citing papers. This helps identify disciplines that are influenced by Taylor's article. In addition, citation context analysis is used to identify the cited concepts and the citation functions of Taylor's article. This highlights the specific influential concepts and the reasons Taylor's article was cited. In other words, this study measured the influence of Taylor's article using three aspects: the number of citations, the content of the cited article, and the citation functions of the article. The results contribute to a deeper understanding of the influence of a pioneer in the area of human information behavior with a user-centered view.

This study answers the following research questions:

- (1) Is the influence of Taylor's article, *Question-Negotiation and Information Seeking in Libraries*, increasing?
- (2) What disciplines do the citing articles belong to?
- (3) What research topics do the citing articles focus on?
- (4) Which concepts from Taylor's article have the most influence on citing authors?
- (5) What functions does Taylor's article serve for the citing articles?

2. Literature review

The citation context analysis is the application of content analysis. Citation function classification and citation content analysis are the two main approaches to citation context research (Small, 1982). Citation function classification focuses on exploring the reasons why a scientific paper was cited and classifies these reasons into broad categories. Citation content analysis aims to identify content cited in publications and divides this content into various concepts.

Before 1990, several studies created their own citation function classifications and applied them to areas of literature to identify citation function distributions. Lipetz (1965) first submitted the classification to examine the relationship between citing and cited papers. Eleven of 29 indicators are related to citation functions; for example, the citing author altered or directly used the cited work. Moravcsik and Murugesan (1975) devised a classification scheme consisting of four dichotomies to codify the functions of the cited references from 30 physics articles. The first pair identified a concept contained in a paper or a tool/technique used in a paper to be cited. The second pair confirmed whether the cited paper helped understand the content of the cited paper or indicated the study related to the citing paper without further statements. The third pair indicated whether the cited paper offered the foundation for the citing paper or served as an additional option. The fourth pair determined whether the claims of the cited paper were approved or disapproved by the citing author(s). Chubin and Moitra (1975) refined the Moravcsik–Murugesan classification and applied it to physics papers. Spiegel-Rosing (1977) explored the reasons the articles were published in *Science Studies* between 1971 and 1974. Among 13 citation functions, “Supporting a statement or suggestions for further readings” was dominant (80%), followed by “history and the state of research questions” (5.8%). Oppenheim and Renn (1978) classified the citations of 23 highly cited articles in physics and physical chemistry into seven categories. Most citations were made as “historical background” (39.4%), followed by “related studies” (18.5%), “use of theoretical equations” (15.7%), “comparison” (12.7%), and “methodology” (10.9%). Frost (1979) used four categories to classify the citation functions of German literary publications and compared the differences between monographs and journals. The results showed that “sharing the views of other researchers” was the most cited reason (18–22%), followed by “using factual evidence” (14–20%), “suggesting further readings” (13–16%), and “supporting their own statements” (8–14%). McCain and Turner (1989) submitted a dichotomy that was similar to the second pair devised by Moravcsik and Murugesan. Although a range of classifications for citation functions have been reported, as Small (1982) noted that most citation functions from different research were the same, but with different terms representing category names.

Studies that explore the influence of publications have analyzed classic natural science and social science research. However, more studies measure the number of citations than use citation context analysis, because citation context analysis is laborious. For example, in the natural sciences, Richard and Pysek (2008) examined the influence of Elton’s book, *The Ecology of Invasion by Animals and Plants*, and found that the book was mainly cited as a fundamental concept source.

In the social sciences, Garfield (1980) measured the influence of Merton—a distinguished sociologist—based on articles citing his publications. Garfield identified 26 cited concepts and divided them into five groups. The number of concepts cited by natural science and social science articles was compared. Coleman and Salamon (1988) focused on the influence of Kuhn’s *Structure of Scientific Revolutions* on psychology literature. They identified four concepts as frequently cited between 1969 and 1983. Most citing papers were philosophical–methodological papers. McCain and Salvucci (2006) reported on the influence of *The Mythical Man-Month*, a book on managing software programs by Brooks in 1975. The results show that concepts in the book were spread across disciplines over time. Anderson (2006) investigated which concepts from Weick’s classic book, *The Social Psychology of Organizing*, were cited by other authors. Twelve types of cited concepts from the book were identified. Anderson and Sun (2010) studied the influence of an article on organizational memory by Walsh and Ungson, examining cited concepts and citation reasons.

3. Methodology

3.1. Data collection

This study used the WoS database to access long-term inter-disciplinary data to extract the bibliographic records of publications that cited Taylor’s article, *Question-Negotiation and Information Seeking in Libraries*. Publications examined were published between 1968 and 2010. Two hundred and ninety-five bibliographic records of citing articles were obtained from WoS and the full-text articles were accessed and printed for citation context analysis. Of the 295 articles, 22 were excluded from the dataset because they were either in a language the author could not read (11 articles) or citation errors from inconsistencies between in-text references and reference lists existed (11 articles). This study analyzed 273 citing articles.

3.2. Data processing and analysis

Each in-text reference was regarded as an independent citation context for analysis. A citing paper contained at least one in-text reference. Three hundred and forty-seven in-text references to Taylor’s (1968) article appeared in the 273 citing articles. The text near each in-text reference referring to Taylor’s article was read carefully. The cited content relating to Taylor’s article was recorded and classified to create a category list of cited concepts. Similarly, the category list of citation functions was developed according to the text near in-text reference. A temporary classification scheme of citation functions was devised after reviewing previous studies. The final version of the classification scheme was developed by modifying the original classification scheme during the classification process.

To understand the research topic differences between the cited and citing articles, each citing paper was assigned a topic based on its abstract and author keywords. If no abstract was available or a main topic could not be identified, the research purposes or full text were examined. All citing papers were read twice at different times to improve the consistency of topics.

After categorizing the citing articles, citing articles in the same category were compared and re-examined to guarantee that consistent criteria were used to classify the citing articles.

All research topics were developed based on the content of citing articles to identify the research topics of the citing papers collected in this study. No research topics used by other studies were referenced. Most research topics can be easily identified based on the information in the Abstract and Research Purposes sections. The names of the research topics were determined based on the basic keywords appearing in the citing papers. When a citing paper included two or more related keywords, the name of the research topic had a broader coverage. For example, the topic of a citing paper relating to both information needs and information seeking was classified as “information behavior.” Finally, 14 research topics were found. Although six research topics (digital libraries, management, women studies, educational informetrics, learning, and medical education) had a small number of papers, they were not incorporated into other research topics because of the topic differences.

Each citing paper was also classified into a specific discipline according to its journal source. The subject of a given journal was obtained using the Ulrichs Global Serials Directory database which assigns at least one subject to each journal. All subjects were incorporated into broader disciplines. When a journal had two or more subjects in different disciplines, its main subject was determined based on its Library of Congress classification number listed in the basic data for each journal indexed by Ulrichs Global Serials Directory.

4. Results

4.1. Citation trends

Fig. 1 shows the number of citations of Taylor's article per year from 1969 to 2010. The article began accumulating citations in the year after its publication. Except for 1971, 1972, and 1974, the article received citations every year. During the 42-year period, a total of 273 articles cited Taylor's article. The article received an average 6.5 citations per year. The rate of citation grew slowly before 2003. The annual number of citations is less than 10, except for 1984 and 1997. The spike of citation frequency appeared in both 2006 and 2007. Although the annual citation frequency fluctuated, an increasing trend is present. This indicates that even though the article was published over 40 years ago, it remains relevant and its influence has increased over time.

4.2. Citing article topics

Table 1 shows that the 273 citing papers represent 14 topics. Information retrieval articles accounted for the largest share (38.5%), followed by information behavior (29.3%), and reference services (19%). Each 11 remaining topic accounted for between 0.4% and 2.9% of the citing papers. Fig. 2 shows the distribution of the topics of the citing articles every 3 years. It indicates that reference service articles dominated before 1984, but have declined since 1984. Information retrieval articles were dominant from 1984 to 2004, and subsequently declined since 1985. Information behavior articles also show an increasing trend from 1991 to 2010 and have dominated since 2005. Articles related to librarians accounted for 33.3% from 1969 to 1971, and the remaining citing articles (except those including the top three topics) accounted for less than 10% from 1981 to 2010. This indicates that Taylor's article has more influence on information retrieval and information behavior studies and that the influence of the article has exceeded its original reference service context.

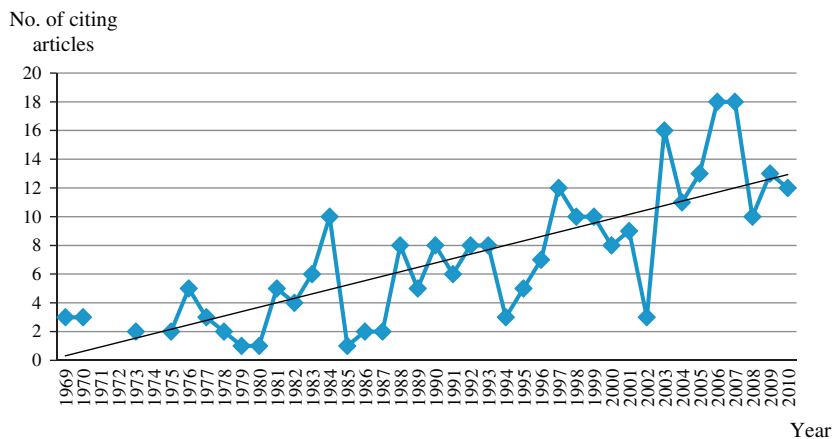


Fig. 1. Numbers of citing articles per year (1969–2010).

Table 1
Distribution of citing article topics.

Topics	No. of articles	Percentage
Information retrieval	105	38.5
Information behavior	80	29.3
Reference services	52	19.0
Information science	8	2.9
Research methods	5	1.8
Information systems	5	1.8
Knowledge organization	5	1.8
Librarians	5	1.8
Digital libraries	2	0.7
Management	2	0.7
Women studies	1	0.4
Educational informetrics	1	0.4
Learning	1	0.4
Medical education	1	0.4
Total	273	100.0

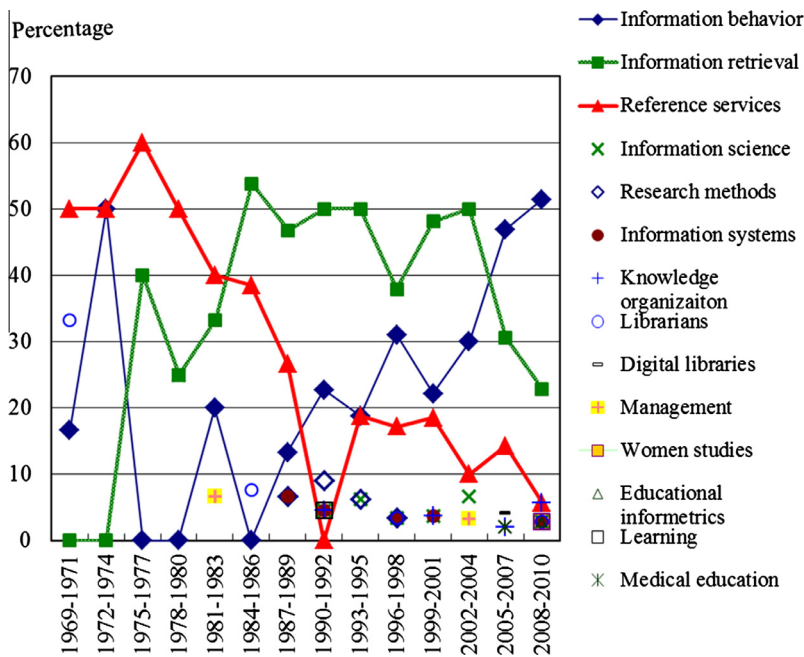


Fig. 2. Percentage of citing article topics by every 3 years.

Table 2
Distribution of citing article disciplines.

Subjects of journals	No. of articles	Percentage
LIS	251	91.9
Computer science	12	4.4
Medical science	4	1.5
Business	2	0.8
Psychology	1	0.4
Women's studies	1	0.4
Engineering	1	0.4
Education	1	0.4
Total	273	100.0

4.3. Citing article disciplines

The 273 citing articles were published in 58 journals across eight disciplines, including LIS, computer science, medical science, business, psychology, women's studies, technology, and education. Table 2 shows that 91.9% of citing articles orig-

inate from LIS journals. Computer science ranks second with 4.4%. This indicates that Taylor's article mainly attracted researchers from LIS, which is the same discipline that Taylor's article belongs to. Although some articles outside LIS have recently cited Taylor's article, the number is small (see Fig. 3). This shows that the influence of Taylor's article remains in LIS.

Table 3 shows the 10 journals that cited Taylor's article most frequently. If a journal changed its title, its previous and current titles were regarded as the same journal, and it is represented by its current title. All 10 journals are LIS journals. *Reference and User Services Quarterly* focuses on issues of reference librarianship. *Library and Information Science Research* and *Library Quarterly* are library science journals. The remaining seven LIS journals focus on topics related to information science.

4.4. Cited concepts

Table 4 shows the 14 concepts extracted from 347 citation contexts. "Four levels of information needs" is the most cited concept, accounting for 31.7%. Taylor divided the process of question formation or information need transitions into four levels: visceral, conscious, formalized, and compromised needs. Compromised needs must be generated from question negotiation interactions, where librarians change inquirer actual needs to compromised needs for users to access library resources. The second most cited concept is "question negotiation" (20.5%). This refers to librarians understanding user needs by conducting reference interviews. Taylor called the reference interview "question negotiation." The third most cited concept is "other concepts relating to information needs" (17.9%), which is any concept relating to information needs excluding the four levels of information needs. For example, users have difficulty expressing vague information requirements, or Taylor's article belongs to information seeking research.

The remaining 11 concepts account for less than 6.9% of the concepts cited. "Five filters" refers to the five types of information filtered from the reference interview to assist librarians in developing compromised needs. The five types of information are the subject of problem, purposes and motivations, personal user traits, relationship between problem and information sources, and answers that users may expect or accept. "Query" refers to user questions, which are dynamic and different from system commands. "Communication" emphasizes that the reference interview is an act of communication between librarians and users. Librarians require good communication skills when interacting with users. "Information sources" are all information sources used to solve user information problems. "Mediator" indicates that reference librarians are a bridge between information resources and user information needs. "Incomplete understanding of the world" explains

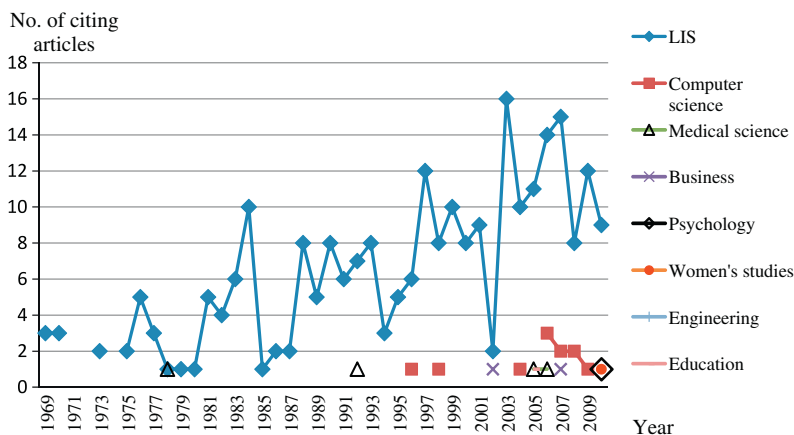


Fig. 3. Number of citing articles by discipline and year.

Table 3
Journals with the most citations to Taylor's article.

Journal titles	No. of articles	Percentage
Journal of the American Society for Information Science and Technology	51	18.7
Information Processing and Management	31	11.4
Reference and User Services Quarterly	26	9.5
Journal of Documentation	17	6.2
Library and Information Science Research	14	5.1
Proceedings of the ASIS annual meeting	14	5.1
Information Research	11	4.0
Annual Review of Information Science and Technology	10	3.7
Library Quarterly	9	3.3
Journal of Information Science	8	2.9

Table 4
Distribution of cited concepts.

Concept	Frequency	Percentage
Four levels of information needs	110	31.7
Question negotiation	71	20.5
Other concepts relating to information needs	62	17.9
Five filters	24	6.9
Query	22	6.3
Communication	15	4.3
Information sources	13	3.7
Mediator	10	2.9
Incomplete understanding of the world	6	1.7
Easy access	5	1.4
User-oriented approach	4	1.2
Game rules	2	0.6
Information system functions	2	0.6
Interview data	1	0.3
Total	347	100.0

why information needs arise, which is similar to the “anomalous state of knowledge” concept (Belkin, 1978). “Easy access” shows that users tend to select the most easily accessible information sources, fulfilling the least effort principle. “Game rules” describe how to access library resources. If users are familiar with “game rules,” they can quickly access required information. “Information system functions” indicate that improving information system functions cannot guarantee that users find information that meets their needs. “User-oriented approach” and “interview data” describe the method and data used in Taylor’s study, respectively. “Interview data” states that Taylor’s results were based on data obtained from librarians.

Examining the 14 cited concepts every 3 years, Fig. 4 shows an increasing trend for the concept, “four levels of information needs.” A decreasing trend was evident for the concept, “question negotiation” and “other concepts relating to informa-

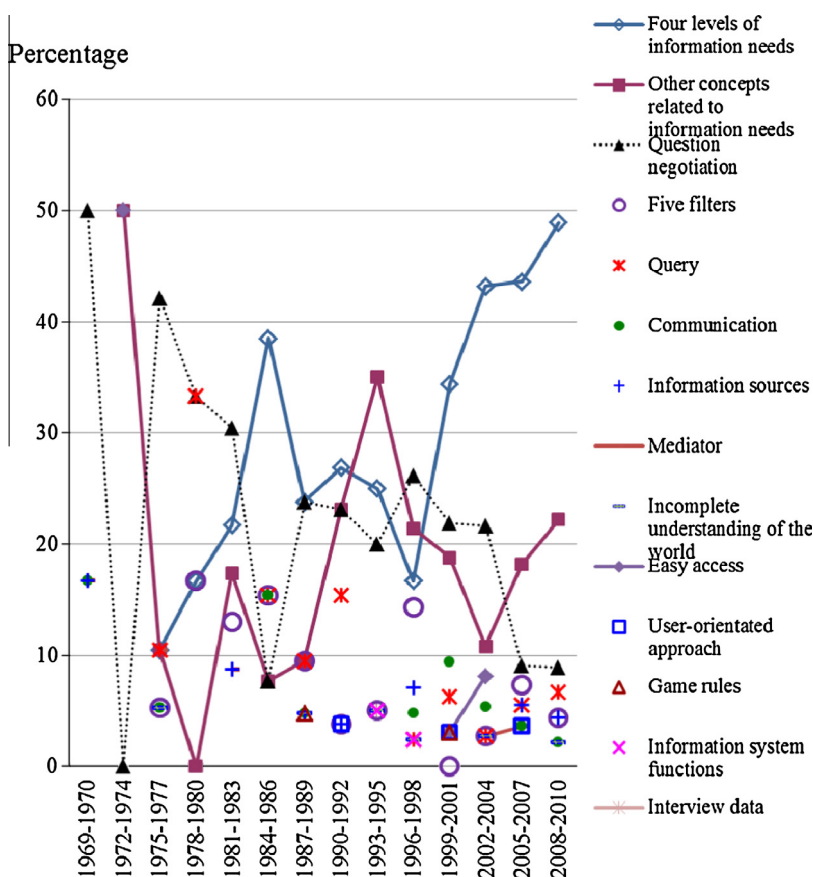


Fig. 4. Changes in percentages of cited concepts every 3 years.

tion needs” showed a stable trend. Citations “four levels of information needs” were considerably higher than the other concepts from 2000 to 2010. This indicates that researchers tend to focus more on the concept “four levels of information needs.” No trends were observed for the remaining 11 cited concepts because each cited concept appeared only in specific periods.

Table 5 shows the distribution of the 14 cited concepts within the 14 citing article topics. Information retrieval research and information behavior research mainly cited the concept of “four levels of information needs,” followed by “other concepts relating to information needs” and “question negotiation.” The fourth frequently cited concept in information retrieval studies was “query,” whereas “five filters” and “information sources” were the fourth most cited concepts in information behavior studies. However, reference service researchers focused on the concept of “question negotiation,” followed by “five filters,” “four levels of information needs,” and “communication.” This shows that the concepts relevant to reference service researchers are different from those relevant to information retrieval and information behavior researchers.

4.5. Citation functions

Table 6 shows the 10 citation functions based on 347 citation contexts. Three tiers were identified according to their percentages. “Related literature” was dominant (30.8%), which indicates that Taylor’s article was most frequently cited as a prior study on a specific topic. It is essential for authors to collect prior studies relating to their papers during the research process. Related literature is often located in the Literature Review or Introduction sections of papers. The second tier contains “evidence” and “views,” each of which has the same percentage (18.7%). “Evidence” indicates that Taylor’s article served as evidence to support the claims of the citing author. “Views” indicates that Taylor’s claims were shared by the citing author(s).

The third tier includes seven citation functions with percentages ranging from 1.2% to 9.2%. “Terms” indicates that the citing article used specific terms contained in Taylor’s article. The cited terms are often the crucial concepts submitted by Taylor, such as formalized needs, compromised needs, and question negotiation. “Background information” indicates that Taylor’s article was cited to help readers understand the background of research questions. “Relationship” indicates that

Table 5
Distribution of cited concepts within citing article topics.

Cited concepts	Citing article topics														Total
	IR	IB	RS	IS	RM	SF	KO	Lib	DL	L	WS	M	EI	ME	
Four levels of information needs	55	39	8	2		1	2	1			1		1		110
Other concepts relating to information needs	32	19	4	2	1	1	1		1			1			62
Question negotiation	14	14	32	2	3	2	2	1						1	71
Query	13	2	3	1		1		1		1					22
Five filters	9	5	10												24
Communication	8	2	5												15
Mediator	4	3	2					1							10
Incomplete understanding of the world	3	2	1												6
Information sources	2	5	3		1			1	1						13
Easy access	1	3								1					5
User-oriented approach	1	2		1											4
Game rules	1	1													2
Information system functions	1			1											2
Interview data					1										1
Total	144	97	68	9	6	5	5	5	2	2	1	1	1	1	347

Note: (1) IR: Information retrieval. (2) IB: Information behavior. (3) RS: Reference services. (4) IS: Information science. (5) RM: Research method. (6) SF: Information system functions. (7) KO: Knowledge organization. (8) Lib: Librarians. (9) DL: Digital libraries. (10) M: Management. (11) WS: Women’s studies. (12) EI: Educational informetrics. (13) L: Learning. (14) ME: Medical education.

Table 6
Distribution of citation functions.

Citation functions	No. of citation contexts	Percentage
Related literature	107	30.8
Evidence	65	18.7
Views	65	18.7
Terms	32	9.2
Background information	25	7.2
Relationship	19	5.5
Definitions	17	4.9
Comparison	7	2.0
Further reading	6	1.7
Methods	4	1.2
Total	347	100.0

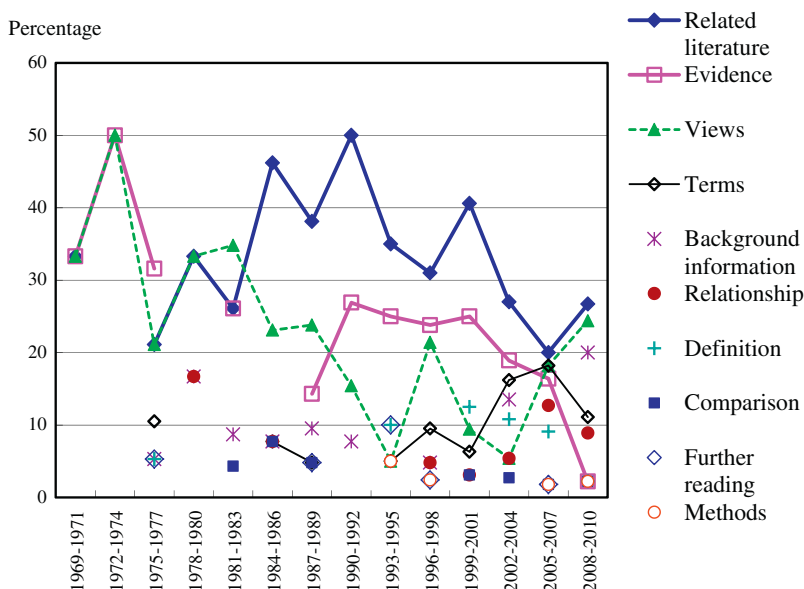


Fig. 5. Changes in percentages of citation functions every 3 years.

Table 7

Distribution of cited concepts within citation functions.

Cited concepts	Citation functions										Total
	RL	E	V	T	B	R	D	C	F	M	
Four levels of information needs	33	5	23	21	6	12	7	2		1	110
Question negotiation	25	22	3	3	10	3	2		2	1	71
Other concepts relating to information needs	17	18	7	5	5	1	3	3			62
Communication	12	1	1		1						15
Five filters	6	3	9	2		1		1	1	1	24
Information sources	4	3	5		1						13
User-oriented approach	4										4
Incomplete understanding of the world	3		1		1			1			6
Query	1	6	6	1	1	2	5				22
Mediator	1	2	7								10
Easy access	1	3	1								5
Game rules			1	1							2
Information system functions			1	1							2
Interview data										1	1
Total	107	65	65	32	25	19	17	7	6	4	347

Note: (1) RL: Related literature. (2) E: Evidence. (3) V: Views. (4) T: Terms. (5) B: Background information. (6) R: Relationship. (7) D: Definitions. (8) C: Comparison. (9) F: Further reading. (10) M: Methods.

Taylor’s claims are the foundation for other studies and emphasizes the influence of Taylor’s article. “Definitions” are the definitions of certain concepts that originated in Taylor’s article. “Comparison” refers to a comparison between Taylor’s article and another study. “Further reading” indicates Taylor’s article was listed as suggested reading. “Methods” indicates that the citing authors used Taylor’s article to clarify the methods used in their studies.

Fig. 5 shows a decreasing trend for the top three citation functions based on observations of the changes in the citation functions every 3 years. Specifically, the percentages of “evidence” and “views” decreased. An increasing trend was observed in the citation functions of “terms” and “background information.” Although “related literature” was dominant from 1984 to 2010, its percentage was close to that of the following citation functions from 2005. This indicates that the differences in the distribution between citation functions tend to become small.

Table 7 shows the relationship between 14 cited concepts and 10 citation functions. When authors reviewed related literature, the concept of “four levels of information needs” was most frequently mentioned, followed by “question negotiation,” “other concepts relating to information needs,” and “communication.” “Question negotiation” was most commonly used by authors to support their statements, followed by “other concepts relating to information needs” and “query.” Regarding Taylor’s views, “four levels of information needs” was the most widely referenced, followed by “five filters.” In addition to frequently serve as the functions of “related literature” and “views,” the concept of “four levels of information

needs” was also dominant in those functions of “term,” “relationship,” and “definitions.” This indicates that the concept of “four levels of information needs” was dominant in five citation functions.

5. Discussion

Question-Negotiation and Information-Seeking in Libraries is a seminal publication by Taylor and is regarded as classic LIS research. It has inspired several information behavior theories and has been used as the foundation for several related studies. The article has been published for 42 years, and this study confirms that Taylor’s article on question negotiation is influential by identifying an increasing trend in the number of citing articles between 1969 and 2010. This indicates that the visibility of the article has not decreased over a long period.

The results show that over 90% of citing articles were published in LIS journals, indicating that the influence of Taylor’s article is mainly in LIS. In other words, the inter-disciplinary influence of *Question-Negotiation and Information-Seeking in Libraries* is limited. However, a slightly increasing trend in the number of non-LIS citing articles was identified after 2003. In addition, the LIS articles focus on different research topics. Of the 14 research topics identified, information retrieval articles account for the largest share (38.5%), indicating that information retrieval researchers are most interested in Taylor’s article. Additionally, information behavior (29.3%) and reference services (19.0%) are dominant. Because a subject relationship is the main reason for which a paper is cited in other documents (Vinkler, 1987), the top research topics of citing papers can reveal the main topics contained in the cited article. The findings of this study support that information retrieval, information behavior, and reference services are the main relevant topics involved in Taylor’s (1968) article. In addition, a close relationship between the three main topics can be identified. Information retrieval is a type of information behavior and is a component of reference services (Johnson & Ury, 2003; Wilson, 2000).

Of the influential concepts in Taylor’s article, this paper confirms that Taylor’s concept of “four levels of information needs” has received the most attention from researchers. Information retrieval researchers were most interested in the concept of “four levels of information needs.” This implies that information retrieval researchers have noted the issue of user information behavior. They attempt to create system interfaces with human intermediary features because information retrieval and question negotiation processes share several characteristics (Vickery & Vickery, 2004). In other words, information retrieval researchers are concerned with incorporating human information behavior research results with information system design (Fidel & Pejtersen, 2004; Joshstone & Tate, 2004).

The concept of “four levels of information needs” manifests the dynamic features in developing questions. Lundh (2010) indicated that Taylor’s theory on the levels of information needs consists of two parts. The first part contains the visceral and conscious need, in which information needs emerge within the mind of the inquirer and cannot be observed by researchers. Information needs can only be realized and studied when inquirers express their information needs and communicate with mediators. Therefore, the process of question negotiation occurs at the levels of formalized and compromised needs. The differences in the two parts may indicate the reason most papers citing Taylor’s levels of information needs focused on formalized or compromised need.

The concepts of “question negotiation” and “other concepts relating to information needs” were also frequently cited. “Question negotiation” was mainly cited by reference service researchers, and “other concepts relating to information needs” received more attention from information retrieval and information behavior researchers. Information retrieval and information behavior researchers focused on concepts relating to information needs. However, reference service researchers focused on concepts relating to reference interviews.

The three most cited concepts do not all show increasing citation trends. “Question negotiation” and “other concepts relating to information needs” citations have decreased over time and “four levels of information needs” citations have become dominant since 1999. This confirms that the concept of “four levels of information needs” is the most influential from Taylor’s article. The top three research topics of the citing articles do not have the same trend. An increasing trend was observed in the percentages of “information retrieval” and “information behavior,” whereas a decreasing trend was observed in the percentages of “reference services.” This indicates that Taylor’s article tended to receive more citations from information behavior and information retrieval studies. In addition, information retrieval and information behavior researchers mostly cited the concept of “four levels of information needs,” whereas reference service researchers mostly cited the concept of “question negotiation.” This study verified that the dynamic process of query formation has been the main concern in the areas on information retrieval and information behavior. By contrast, the concept of question negotiation received more attention before 1987 and was not the focus of subsequent studies on reference services.

Regarding the citation functions of Taylor’s article, citations for “related literature” were higher than those of other functions and became dominant since 1984. This indicates that Taylor’s article is a pioneering study and is often used as an example of related literature on a specific area, such as information needs or question negotiation. However, the findings of the current study are inconsistent with those of Spiegel-Rosing (1977), Oppenheim and Renn (1978), Frost (1979), who identified that supporting a statements, or offering background information, or sharing the views of other researchers was the dominant citation function. This may be attributed to the differing classification schemes or complex reasons for citing a specific paper. Additionally, Taylor’s main contribution is in the area of concepts rather than methods based on the percentage in “methods.”

6. Conclusion

LIS researchers have examined information needs, seeking, and use for many years. Researchers have focused particularly on how research results from a user-oriented perspective are applied to information systems and library service design. Taylor's article, *Question-Negotiation and Information Seeking in Libraries*, indicated that inquirers may not be conscious of their information needs or cannot express their information needs clearly and accurately. Information specialists can identify actual information needs of inquirers and help transform actual information needs into compromised needs during the process of question negotiation. Taylor dedicated his academic life to designing user-oriented information systems. The 1968 article also emphasizes the importance of developing user-driven human to system interfaces in information systems, including libraries.

Because Taylor's article received numerous citations and is a pioneering information-behavior study using user-oriented perspectives, this study explored its influence using three aspects. First, this study confirms that the Taylor's article is a seminal work with increasing influence regarding the number of citations. Although the influence of Taylor's article is mainly in LIS, an increasing trend in the number of citations from non-LIS research has appeared since 2003. Second, this study identified 14 influential concepts contained in Taylor's article. Taylor's concept of "four levels of information needs" has had the largest effect on other researchers, particularly information retrieval researchers. This indicates that Taylor's influence has exceeded the information need and reference interview context of his original study. Moreover, an increasing trend for the concept of "four levels of information needs" confirms that this concept is a crucial issue for information retrieval and information behavior studies. Third, 10 citation functions of Taylor's article were analyzed. The results show that Taylor's article is regarded as a pioneering work on information needs or question negotiation, and is the most cited example in related studies. The cross analysis of the cited concepts and citation functions offers further details on the influence of Taylor's article.

The results of this study show that the contribution of Taylor's article has exceeded its objective. The objective of the 1968 article was to understand the process of question negotiation between library users and library systems to examine and improve the communication skills of librarians. The claims submitted by Taylor were used as the basis for other studies. Taylor's article has differing functions for various cited articles. Because the main concepts contained in Taylor's (1968) article originates from Taylor's (1962) article, this study suggests that the influence of the 1962 article can be further examined to determine the comprehensive influence of Taylor's question-negotiation model.

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