



# Influence of *human behavior and the principle of least effort* on library and information science research



Yu-Wei Chang\*

Department of Library and Information Science, National Taiwan University, Taipei, Taiwan

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## ABSTRACT

This study identified the influence of the main concepts contained in Zipf's classic 1949 book entitled *Human Behavior and the Principle of Least Effort (HBPLE)* on library and information science (LIS) research. The study analyzed LIS articles published between 1949 and 2013 that cited *HBPLE*. The results showed that *HBPLE* has a growing influence on LIS research. Of the 17 cited concepts that were identified, the concept of "Zipf's law" was cited most (64.8%), followed by "the principle of least effort" (24.5%). Although the concept of "the principle of least effort," the focus of *HBPLE*, was not most frequently observed, an increasing trend was evident regarding the influence of this concept. The concept of "the principle of least effort" has been cited mainly by researchers of information behavior and served to support the citing authors' claims. By contrast, the concept of "Zipf's law" received the most attention from bibliometrics research and was used mainly for comparisons with other informetrics laws or research results.

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## 1. Introduction

The principle of least effort (PLE), a concept advanced by the American linguist George Kingsley Zipf, indicates that people complete tasks by choosing the way of least effort among various options (Zipf, 1949). To prove that the PLE is an indication of human nature, Zipf analyzed numerous empirical data collected from various human activities including those related to language, geographic distribution of the population, economic activities, social status, and collaboration, and used mathematical formulae to explain his findings. Zipf explained the PLE in detail in his classic 1949 entitled *Human Behavior and the Principle of Least Effort: An Introduction to Human Ecology (HBPLE)*.

Opinions on the PLE are controversial. A few researchers have criticized the PLE for its oversimplification of human behavior (Cummins, 1977; Rapoport, 1957), whereas other researchers have supported and further explained the concept. Gratch (1990) stated that the PLE is the result of human experience and that exerting the least amount of effort is not equivalent to laziness. Case (2005) reported that people are willing to acquire lower-quality or less information to reduce their expenses.

The PLE represents a common human behavior; it may thus be expected that the *HBPLE* has become visible in various fields and applied to various human activities. *HBPLE* was also compared with similar theories and was reconceptualized in the field of library and information science (LIS). For example, one study indicated that Mooers' law was derived from the PLE (Bierbaum, 1990). Mooers' law states that users would rather not have information if having that information is

\* Tel.: +886 2 3366 1743; fax: +886 2 2363 2859.

E-mail address: [yuweichang2013@ntu.edu.tw](mailto:yuweichang2013@ntu.edu.tw), [yuweichang2007@gmail.com](mailto:yuweichang2007@gmail.com)

painful, which is true even for users who can efficiently access information by using information retrieval systems (Austin, 2001; Mooers, 1996). Saving readers' time, one of the five laws of library science, is also similar in meaning to the PLE (Gratch, 1990). The LIS publications on PLE have indicated that the concept of the PLE is connected to various topics, such as cataloguing (Chrzastowski, 1999; Wei, 2005), citation (White, 2001), information services (Chrzastowski, 1999; Duan, 2004), information seeking behavior (Bigdeli, 2007; Bronstein, 2008; Kebede, 2004; Xu, Tan, & Yang, 2006), information retrieval (Chen & Liang, 2000; Kim, 1982; Wang, 2000), and the location of resources (Chrzastowski, 1995; Wang, 2001). This shows that *HBPLE* has established its influence on various subfields within LIS research. To understand the relationship between *HBPLE* and LIS research, this study examined the influence of *HBPLE* on LIS articles.

Because the PLE is the core of *HBPLE*, I assumed that the PLE is the most frequently cited concept in *HBPLE*. Particularly, I assumed that the PLE is cited most by authors of information behavior articles because it has been regarded as an essential theory of information behavior according to the PLE being listed in the 2005 book, *Theories of Information Behavior*. Information behavior research is multidisciplinary and has been an essential subfield in LIS. Some theories of information behavior originating outside LIS have guided LIS researchers in advancing information behavior research, and the PLE is one example of these theories of information behavior. However, these assumptions required examination. I found that a few articles on the PLE did not cite the concept of the PLE in *HBPLE* and that certain publications not on the PLE cited the concept of the PLE in *HBPLE*. Furthermore, publications include numerous concepts. Apart from the PLE, *HBPLE* may consist of other influential concepts that have attracted LIS authors' attention.

To clarify whether the concept of the PLE has received the highest attention among all concepts in *HBPLE*, I examined which concept in *HBPLE* was most frequently cited by authors of LIS articles that were published between 1949 and 2013. This study also analyzed the citation functions that reveal the possible reasons why authors cite the concepts in *HBPLE*. Combining the analyses of cited concepts and citation functions can reveal the influence of *HBPLE* on LIS research in detail. In addition, I analyzed citation frequency trends and the research topics of citing articles to identify emerging trends in the influence of *HBPLE* on LIS research and to determine which topics in LIS research have involved applying the concepts in *HBPLE*. The assumption of whether information behavior articles cite the concept of the PLE most can be verified. The results contribute to the understanding how a classic book on linguistics has influenced LIS research from three aspects: the number of citations, cited concepts, and citation functions.

This study answers the following research questions:

- (1) Does the concept of the PLE have the most influence on citing authors among all concepts in *HBPLE*?
- (2) For the citing articles, what functions does *HBPLE* serve? What functions does the concept of the PLE serve?
- (3) What research topics do the citing articles focus on? Is the concept of the PLE cited most by information behavior articles?

## 2. Literature review

Content analysis is useful for demonstrating the substantial influences on works. Citation context analysis, which is derived from the method of content analysis, can be used to identify the relationship between the contents of citing and cited works by examining partial texts surrounding a specific citation (Small, 1982). Citation context analysis relies on the researcher's judgment. Cited concepts can be confirmed by examining the content of cited work. However, analyzing citation functions is difficult because citation functions may not be apparent in texts. Some researchers have argued that authors' motivations for citing literature are complex and indicate that only authors know why they cite a specific work (Case, & Higgins, 2000; Shadish, Tolliver, Gray, & Gupta, 1995). In such a situation, interviewing or surveying citing authors is another common method for exploring authors' citing behavior (Bonzi & Synder, 1991; Harwood, 2009; White & Wang, 1997). However, some limitations still exist in interviews and surveys. Researchers have encountered difficulty in contacting all citing authors, especially when citing authors are deceased. This leads to a limited number of interviewees who can be interviewed. In addition, citing authors may forget why they cited a work a decade previously or may withhold the true reasons because they had negative intentions (Harwood, 2009). Because I conducted a longitudinal study to trace the changes in cited concepts and citation functions, I performed citation context analysis to explore the meaning of citations.

The method of bibliometric analysis is also used to measure the influence of a publication by counting its citation frequency and investigating the characteristics of citing papers (Carvalho, Diniz-Filho, & Bini, 2005; Chu, 2001; Furner, 2003). A high number of citations indicate greater influence. Although changes in the influence of a publication over time can be easily tracked, connections between the contents of cited and citing documents cannot be identified. This implies that the influence of a publication can be deeply understood by combining citation context analysis and bibliometric analysis. I used bibliometric analysis to observe the annual changes in the number of citations that *HBPLE* and specific concepts in *HBPLE* received.

Citation context analysis contains two types of content analysis: cited concepts and citation functions. The analysis of cited concepts is undertaken to identify content that has been cited by other researchers. A classic work has substantial influence on researchers in a specific field or across fields and usually becomes a primary subject of study. In the 1980s, Garfield (1980) identified 26 cited concepts from publications by Merton, a distinguished sociologist. Colemand and Salamon (1988) identified the main cited concepts embedded in Kuhn's *The Structure of Scientific Revolutions*. Since 2006, more related studies have appeared. Researchers have explored the influential concepts embedded in classic works on social psychology

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