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Section 3: Behind the data

Patenting Library Science Research Assets

Gali Halevi, MLS PhD and Dr Henk F. Moed

There are many factors working in today's scientific landscape, most prevalent being budgetary constraints, that make the ability to measure Return on Investment (ROI) crucial for funding decisions. Academic research is being scrutinized in search of a metric or evaluative model(s) that will enable decision makers understand the potential of its results and ways it will impact the economy and society as a whole. One of the frequently used and most naturally occurring ways to measure science's impact has been measuring its patentability, which is also evident in the numerous studies that explored the phenomenon of basic research patenting and its effects on both academic and industrial progress. The passage of the Bayh-Dole Act in 1980 contributed to the increase of university patents applications. This act gave universities the right to own and license the results of their government-funded research and in return share a portion of the revenue derived from such patents with the inventor. It has been noted that this increase is more evident in certain disciplines and fields of research such as Biotechnology, Pharmacy, Engineering etc. Unlike research in natural and life sciences, research in social sciences, as well as arts and humanities is more difficult to measure on the research-patent-revenue scale. These disciplines, by their very nature, explore personal, social, national and international phenomena over time and their results qualitatively inform policy and economy in ways that are not necessarily patentable.

The field of Library Science has always been considered a hybrid area of research which also evolved over time to include Information Science. Aligning more closely to Social Sciences in its early years, the field expanded to include elements of computer science and information management. Examining the field and its development from paper to electronic information solutions, one might assume that technology was the driver of this transformation. This article will show that in fact, it was Library Science research that informed and inspired the development of information retrieval solutions, sometimes years before the technology was available to translate it into viable algorithms and computerized modules.

The purpose of this study is to demonstrate the technological and economical viability of Library Science and to show the areas of technology where research in this discipline had the most influence. Influence was measured by analyzing the manners by which articles that were published in library journals are cited in patents.

The analysis addressed the following aspects:
(a) How many library journals were cited in the patents covered by TotalPatentTM between 1992-2011, and how often?
(b) Which articles were cited most frequently?
(c) How can one characterize the content of the cited articles and the patents citing these, using keywords or subject classification systems?
(d) Who were the assignees of the patents citing library journals?

What was the time delay between the publication year of the cited work and that of the citing (granted) patent?

Methodology

Leading Library journals showing a high SNIP score were analyzed. SNIP is a journal metric available in Scopus which takes into account the citation behaviour and characteristics in the subject covered by a journal. Scopus™ journal analytics includes the SNIP metric which allows a comparison of subject-related journals; in this case, Library & Information Science journals.

In the first phase, the Scopus™ SNIP journal ranking analysis retrieved 42 journals which were then searched for, by using the Non-Patent-Literature citation field in TotalPatent™. TotalPatent™ is a comprehensive database covering applications and patents granted at/by a large number of patent offices around the world, including the US (USPTO), European (EPO) patent offices and World Patent Office (WPO) from 1992 onwards.

In the second phase, all patents citing these journals were retrieved and the non-patent-literature cited in them was extracted. These citations were manually analyzed and all the library journals' articles were collected.

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The third phase of the study involved building a database including the following data fields: Journal Title, Total Number of Citations, Number of Unique Cited Articles, Unique Articles Titles, and Year of publication, Number of Citations, Patents Numbers, Patent Titles, Filing/Issue Dates, Inventor, Assignee, and Classifications. It must be noted that the numbers of citations presented are approximate, due to unexpected variations in the journal titles included in the non-patent citations, and to double counts because of the occurrence of patent families of more or less identical patents submitted to multiple patent offices.

**Results**

Of an initial list of 42 library journals, 8 were found to be cited in patents covered by TotalPatent™. These are listed in Figure 1. In addition to the total number of citations, the number of unique articles cited was also analyzed. The Journal of the American Society for Information Science and Technology was the highest cited with a total of 76 citations overall and 24 unique articles cited. Library Hi-tech and Library Journal followed with 58 and 50 total citations and 17 and 13 unique articles citations respectively.

In order to better understand the themes covered in the articles and sketch the domains to which they pertain, the articles’ author given and indexed keywords as well as their titles were collected from Scopus™ and built a word cloud featuring these keywords, presented in image 1.

The word cloud was created using Wordle™, a free web-based application that enables the generation of word clouds from free text. In order to create an accurate word cloud as possible, phrases within the titles and keywords were kept by using Wordle™ advanced functionality.

Analyzing the articles keywords as demonstrated by the word cloud shows that the articles feature information retrieval and indexing, and information and documents management systems which pertain to electronic and digital libraries development.

This finding was of particular interest because the years of publications showed peaks in the years when the electronic library and automated information retrieval systems were beginning to be investigated. Figure 2 which indicates the publication years of the cited articles, clearly demonstrates relatively high numbers of citations to articles that were published at the end of the 1980s and late 1990s, when information retrieval and management research were flourishing.
An analysis of the correlation between the year of article publication and its citation in a patent showed that the time lapse between the publication of the article and its citation in a patent is significant, ranging from 10 to 20 years. This indicates both technical and conceptual developments within the field before the technology was there to apply its broader concepts such as online commerce.

Two examples to further portray these results are: Article “NOTIS: The System and Its Features”, published by James Meyer (1985) in Library Hi Tech, cited 11 times in patents published between 1999 and 2006. The article featured an online library management system that integrates the public access catalog and in addition included acquisitions, serials management, authority control, and circulation. Patents citing the article include information management systems as well as online purchasing systems that handle products management, purchasing and exchanges. The second example is an article, “MAGGIE III: The Prototypical Library System”, published by Kenneth E. Dowlin (1986) in Library Hi Tech, featuring an integrated library system that supported a public access catalog and included a cataloging interface, bibliographic maintenance, circulation, electronic mail, and community information databases. The article was cited 10 times in patents published between 1999 and 2008. The patents citing this article made use of some of its concepts to develop electronic commercial sites that manage information such as sales transactions and processing of products registration and returns.

To be able and visualize the subject fields covered by the citing patents, the titles’ words were collected and constructed in a word cloud (see Image 2). As can be seen, the patents focus on electronic information administration, navigation, and products and services management in commercial systems.

The subject areas as they emerge from the titles’ words correspond to the major classes to which the patents were assigned. When analyzing the classifications of the citing patents it was evident that a large majority of them fall in the area of Data Processing with subcategories ranging from financial, business, and databases structure to digital processing (see Figure 3). For example in the patents keywords word cloud the topics information systems, personalized, and computers, clearly dominate while the classifications pertain to parallel applications in areas of computer processing. In turn, these correspond to the heavy emphasis on information management in the journals articles. The thread of information and data management combined with customer management and personalization is carried through the articles keywords and the patents titles and classifications.

An examination of assignees revealed 55 unique corporate entities with only one exception of a university. Looking at the top 5 assignees, one can notice the domination of information management companies as well as online purchasing and commercial corporations (see Figure 4).

Discussion
In earlier studies relationships between research and patents links were examined, in the aim of finding a direct linkage between a researcher and his/her patent application. The study presented in this paper was focused on finding citations of Library Science journals in patents filed between 1992 and 2011, and administered in TotalPatent.

The analysis of the citation of Library Science journals in patents revealed some interesting observations. First, the most cited journals in this field are those which cover research studies that pertain to software development especially in the domains of information and/or data management.

Second, the articles’ keywords as shown in the word cloud strongly indicates the themes information and documents retrieval which include indexing, mining browsing etc. Other themes indicating the diversity within the field were those pertaining to multimedia management, graphics retrieval and the web. This is of particular interest considering the fact that these articles were mostly written when the internet was in its infancy, indicating forward looking and innovative approaches within the field.

Thirdly, examining the citing patents and analyzing their titles’ words showed a strong focus on information systems but also on products which correlates to the above articles’ content and to the overall classifications being in the areas of data processing.

Lastly, the modules featured in these articles were originally developed for library transactions management systems and have inspired commercial uses in online commerce. The library system serving the public and exchanging different types of commodities such as books, audio and video items etc., has unique properties that allow for this relationship between commercial and public purchasing. The library systems support exchanges, client information management and public interfaces which are similar in essence to those needed for online purchasing.

Overall, the analysis showed that library systems were developed before online commerce was conceived and in a way inspired their development. The time lapse between the articles’ publication year and the year of their citations in patents featuring systems and modules is of importance: These library systems were developed in a time when the internet as we know it today did not exist and demonstrate forward thinking and innovative breakthroughs that were turned to far reaching applications.

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Notes:


References: