

Monetizing Usage of Scholarly Collections with Patent Citation Analysis

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Abstract

Based on a series of independent studies conducted by Dr. Anthony Breitzman of 1790 Analytics, IEEE has learned that granted patents cite scientific and the technical literature found in journal articles, conference papers and industry standards. This paper outlines the findings of three studies conducted by 1790 Analytics and discusses the implications for library professionals and members of the scientific and scholarly community. Patent citation analysis is a viable metric to quantify both usage and value of access to scholarly materials at universities, corporations and government research centres.

Keywords: Patenting, technical innovation, usage metrics, citation.

1 Introduction

Both the library and scholarly communities emphasize the importance of quantifying usage to measure the relative value of scholarly resources. Journal usage in the era of print-only materials was measured by the effort needed to restock journals after each use. Today, usage data is a priority for academic and corporate organizations as demonstrated by the COUNTER initiative. Usage measured by articles downloaded is an accepted method to judge the relative value of a full-text electronic resource. The more full-text articles downloaded, the more the resource is needed by the client community.

The annual publication of the Journal Citation Report by Thomson Scientific is generally accepted as a more precise measure of value, quantifying the citation impact of existing scientific journals on the latest research. This may be viewed primarily as an academic measure or metric. Citation impact of a journal title to published science shows its importance to scholarship but cannot readily be valued in financial or economic terms. Because citation impact is a measure of both quality and usage, it is used as an accepted approach to justifying subscriptions and the ongoing costs of maintaining a scientific collection. Measuring value with journal citation impact is a more sophisticated approach to quantifying value than then by simply counting downloads. Downloads can be

the result of first year students navigating a new database, robotic activity or experts developing the next generation of technology or medical research.

The purpose of this paper is to propose that libraries introduce an additional metric to their approach in valuing scholarly collections: patent citation analysis. Three studies conducted by an independent research firm outline the use of scholarly materials. The first shows the patent set from 1997 to 2004 issued by the United States Patent and Trademark Office. A second study, with a similar methodology, outlines the use of scientific research in the patents granted in 2005 by the European Patent Office. The third report describes case studies of high-value patents in key hi-technology areas, demonstrating examples of IEEE journals used in the development of each. 1790 reports that approximately ninety-five percent of the citations in patents granted by the US Patent Office are cited by the inventor and her organization as part of the patent development process. The balance is assigned as part of the patent approval process by patent examiners. Patents granted by the European Patent Office include non-patent citations that are assigned exclusively by the patent examiners. In both cases, scholarly material, journals and conferences, and standards are cited heavily and are regarded as the basis or foundation of the new invention.

Dr. Anthony Breitzman provides background information and a broader discussion on additional aspects to the study which warrant discussion, not covered within the scope of this conference paper. In addition to quantifying and analyzing citations used, Dr. Breitzman discusses the underlying principle of science linkage to patent value. He has developed numerous statistical techniques to demonstrate that patents based on pure science and scholarship, as demonstrated by journal citations, have more value than inventions which cite only prior patents [2] [5] [6].

2 Series of Quantitative Studies

This paper is based on three studies completed by Dr. Anthony Breitzman of 1790 Analytics.

- I. "IEEE and Patents: An Analysis of Patent Referencing to IEEE Papers, Conferences and Standards" 1790 Analytics, 23 May 2005
- II. "The Influence of IEEE on Key Patents" 1790 Analytics, 12 January 2006
- III. "Analysis of European Patent Referencing to IEEE Papers, Conferences and Standards," 1790 Analytics, 13 April 2006

The first of the three provides citation counts or usage for eight unique patent sets. The first is the top 25 organizations that were granted the most patents in 2004. In addition to this data set, the analysis includes seven more categories: optics, medical devices, computer hardware, computer software, semiconductors and information storage. Data is gathered for all patents registered in each category from 1997 to 2004 and presents the most cited publishers in each patent set.

The top twenty five patenting organizations in 2004 were: IBM, Hitachi, Matsushita Electric, Samsung Electronics, Canon, Hewlett Packard, Micron Technology, Intel, Sony, Toshiba, Fuji-Photo, Fujitsu, Siemens, GE, NEC, Philips Electronics, Bosch, Texas Instruments, Mitsubishi Electric, Infineon, Seiko Epson, AMD, Honda, Kodak, Denso [2, p. 4]. Among these organizations, patents granted ranged from 3,270 by IBM to 763 awarded to Denso. These companies represent the leading corporations worldwide in hi-technology and include Asian, European and North American firms.

With all of the citations counted from 1997 – 2004 for these twenty-five companies, the total universe of references to non-patent literature is 121,429. Each reference was assigned to a publisher. The results are found in table 1 below:

Publisher	Patent Citations 1997-2004
IEEE	60,207
US Dept of Energy	8,247
American Institute of Physics	7,914
Elsevier Science	7,599
ACM	6,356
SPIE – Int Society Optical Engs	4,058
IBM Corp.	2,938
IET <formerly IEE>	2,581
ACS	2,493
Institute Pure Applied Physics	2,380
IEEE/JPN Soc App Physics	2,311

Electrochemical Society Inc.	2,245
IEICE Inst Elec Info Com Eng	2,143
American Vacuum Soc/AIP	1,932
Materials Research Society	1,605
J. Wiley & Sons/Wiley-Verlag/	1,455
Pergamon-Elsevier	1,353
Optical Society of America	1,325
American Physical Society	1,173
SID – Society for Info Display	1,113

Table 1: Number of Patent References from Top 25 Companies to Top 20 Journal Publishers. Source: "IEEE and Patents: An Analysis of Patent Referencing to IEEE Papers, Conferences and Standards" 1790 Analytics, 23 May 2005

The following conclusions are drawn by the analysis of citations from this group: A majority of the citations are drawn from not-for-profit society publishers rather than from commercial publishers. Out of the 121,429 total citations analyzed, 108,083 or 89% were to society publishers. Conference papers, journals and even standards documents are cited, not just the journal literature.

In the European Patent Study, a similar methodology was conducted for the patents granted by the European Patent Office in 2005. Results were similar not only for the citations used by the top twenty five patenting organizations but also for the analysis of all patents registered in select hi-technology categories of interest to IEEE. IEEE commissioned this European Patent study based on feedback after the release of the first study. Were the distribution of citations biased to publishers or content from North America? The study of the 2005 European Patent set proves that results were similar for patent sets derived from either the USPTO or the European Patent Office. [4]

Anthony Breitzman's studies show a consistent pattern of usage of scholarly literature in patented technology. This presents opportunities for members of the scholarly and library communities to use this data and to develop new methodologies and practices for quantifying the value of scholarly collections.

3 Relating Patent Impact to Collection Value

Note that universities and other organizations of higher education hold patents, cite scholarly literature and derive financial rewards from these institutional assets. The December 2004 Chronicle of Higher Education notes that the top US universities earn significant royalties from the patents they hold: The universities earning the most revenues from patents were:

New York Univesity	\$85,933,234
University of California System	\$61,119,000
Wisconsin Alumni Research	\$37,573,468
University of Minnesota	\$37,492,778
University of Florida	\$35,248,484
University of Washington	\$29,131,798
University of Rochester	\$26,741,537
California Institute of Technology	\$25,359,000
Michigan State University	\$24,462,676

Table 2: Licensing Revenues and Patenting Activity, Fiscal 2003: Source Association of University Technology Managers, as published in the 3 December 2004 Chronicle of Higher Education.

Patenting is the product of research and development which takes place at both academic and commercial organizations. Those patents with value are often times based on library resources. It is surprising that the relationship is not more studied by the library community as an important means to justify and/or to grow resources provided to the library.

In the corporate sector, it has been noted anecdotally at hi-technology companies like Sun Microsystems and Tyco

Electronics, both in the 'Silicon Valley' of Northern California, that corporate or commercial libraries are located directly under the control of the R&D units of the organizations, in service of the user community. The bond between research and development and libraries are acknowledged from both a financial and organizational perspective. Previously, corporate libraries had been found within the general administrative areas of American corporations like human resources or facilities. Under the old arrangement, the value of scholarship may not have been fully appreciated.

4 Examples of High Value Patents [3]

"A patent assigned to Immersion Corporation, describing a method for adding the sense of touch to interactions with digital media. This technology for adding feeling to a controller holds significant promise for robotic assisted surgery and medical simulations. Currently, however, its highest impact is in the video game market. This patent is licensed to Microsoft and is the basis for Microsoft's populare sidewinder force-feedback joystick. Also, in March 2004, a US court granted Immersion an injunction to halt sales of Sony Playstations and 47 video games that infringed on Immersion's related patents for its 'feedback' controls. Sony was also ordered to pay over \$90 million in damages for patent infringement related to his patent and related technology. The nine different IEEE articles referenced in this patent suggest that IEEE science provided an important foundation for this technological development." [3, p.ii-iii.]

Universities are an important source of technological invention, and they are becoming increasingly eager to patent their inventions. IEEE articles form an important foundation for many high-impact university patents.

"For example, patent 6,233,550 is assigned to the University of California. This patent describes a "Method and apparatus for hybrid coding of speech at 4kbs" and was issued in May 2001. Speech coding and compression is an important component of communication systems, and this patent has had a strong impact since it was issued. Although it is less than five years old, this patent has been cited by 26 subsequent patents. This is almost seven times the average number of citations received by patents in the same technology class and year. ...The 550 patent cites 37 previous publications. Out of these, 27 are articles in IEEE journals. These articles have titles such as 'M-LCELP Speech Coding at 4Kbps' and 'High-Quality Speech Coding at 2.4 KBPS based on Time-Frequency Interpolation". The similarity of these titles to the patent tile suggest that these scientific papers are important pre-cursor to the patent, which in turn has gone on to have strong impact on speech compression technology." [3, p.5-6.]

5 Academic, Corporate Library Reaction to Patent Citation

Since these and related prior studies were released, feedback within the library and publisher communities have been mixed regarding the notion of using patent citations to quantify the value of scholarly collections. Among the community of patent examiners at the USPTO, IEEE has received positive feedback on the value of this approach.

"Thank you for your analysis of the *Effect of IEEE Publications on the NC State Patent Portfolio*. This is relevant information in allowing NC State to maintain its position among the top patenting organizations within the larger research community." James L. Oblinger, Chancellor, NC State University, April 12, 2005

However, early feedback shows that this approach has not been widely adopted by libraries despite some interest by both academic and commercial libraries in adopting this approach.

Conclusion

Economists speak of productivity of basic inputs: land, capital and labor. Individuals or organizations that increase the productivity of these basic inputs create value in economic terms. Scholarly collections increase the productivity of the key inputs of the research and development process: capital and labor. The increase in productivity may be measured by the value of the new patents generated.

This brief paper has shown some evidence that access to scholarly collections allows inventors and their organizations to patent novel inventions that generate licensing revenues, new products and notoriety for the patent holders. Patents are assets that are valued in monetary terms by organizations. Since the link between science citations and patent value has been documented in economic literature, libraries are presented with a unique opportunity to document and communicate their unique contribution to new product development and the research and development process.

It is recommended that this approach to monetizing the value of access to scholarly collections be studied from more perspectives, not relying solely on the work commissioned by IEEE.

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