



Review

Roots and development of intellectual property management research: A bibliometric review



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ABSTRACT

In recent years, intellectual property (IP) has become a crucial aspect in modern management practices, especially for innovative technology-based organizations. Correspondingly, growing numbers of studies are conducted each year to address various aspects of IP management (IPM). Nevertheless, the research field is still relatively fragmented and researchers lack a systematic understanding of the existing body of knowledge. The purpose of this paper is to investigate the underlying knowledge structure and the evolution of IPM research. To accomplish this goal, we analyzed 773 source articles published between 1980 and 2012 using bibliometric techniques including citation and co-citation analysis. We broadly searched for research articles that focused on IP management in the two largest academic databases (Web of Science and Scopus) and manually refined the search results. The results indicate that intellectual property management is a fast-growing research field with theoretical roots in law, economics, and management. Based on the citation data, we identified the most cited studies that form the intellectual core of IPM research. A co-citation diagram was plotted and five main research themes were uncovered. The center of the diagram is formed by studies on the role of IP in improving firms' appropriability. Surrounding the center are studies on the openness of IP strategy and the economic impact of the patent system; the former has become a heated topic over the recent decade, while the latter has lost popularity. Another two groups of studies emerged at the rear of the diagram, namely IP valuation and optimal IP licensing strategy. The article concludes by providing suggestions and implications for future research.

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1. Introduction

As shown by many indicators and recognized by many scholars, the last few decades have witnessed an ongoing transition to a knowledge-based economy [1,2]. According to economists, knowledge is a common type of public resource and is non-excludable in nature [3]. In order to appropriate value from R&D and innovation efforts, intellectual property rights (IPR) are needed to protect valuable knowledge. The importance of managing intellectual property (IP) has been realized by more and more managers, especially those in technology-intensive firms. Among recent technology headlines was Google's acquisition of Motorola Mobility

for \$12.5 billion; the transaction was primarily initiated for the 1700 wireless patents Motorola held, which were essential for Google's strategic move into the consumer electronics market. At the same time, we have seen a surge in the number of academic studies and publications in the field of IP management (IPM). The research field of IPM emerged from diverse roots in economics, law, and management [4] and has grown rapidly over recent years and accumulated its own body of knowledge. Nevertheless, the field is still fragmented and lacks clarity in its research trajectories [5]. Therefore, a comprehensive study on the current status, future trends, and underlying intellectual structure of the field of IPM is needed.

From a legal perspective, the term "intellectual property" (IP) refers to a creation of the mind for which exclusive rights are recognized [6]. Common forms of intellectual property rights include patents, trademarks, copyrights, and trade secrets. Intellectual property has long been treated as legal assets. However, it

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was not until recently that both academic researchers and practitioners started to view IP as business assets from which value could be derived [7]. This transition is also reflected in how firms deal with IP issues in their daily operations. In the past, activities related to IP were mostly carried out by the legal department of the organization or outsourced to law firms. Currently, we see more involvement of personnel from business and strategy, as well as R&D, in IP related activities, such as patent filing and licensing decisions, or enforcement of IP rights [8]. To some extent, the combination of expertise in various aspects, including law, management, economics, technology, and public policy, has contributed to the fragmented nature of IP management research.

This study addresses the gaps in our understanding of the field by using bibliometric techniques to uncover the knowledge structure of IPM research. Our study differs from previous reviews in two ways. First, instead of focusing on the consensus list of “key articles” or papers from a few specific journals, we searched broadly for all relevant papers in IP management. By conducting a citation and co-citation analysis of this large sample, we are able to acquire a comprehensive understanding of the current status and the evolution of this research domain. Second, unlike prior qualitative reviews [4,5,9,10], we adopted quantitative methods and provided objective clues on the knowledge structure of the field. Based on the results of the bibliometric analysis, we provided a broad overview of the research field and identified the intellectual core and the underlying knowledge structure. Moreover, we showed how the field of IP management has evolved over time and offered suggestions and implications for future research.

In Section 2, we present a summary of previous review papers on IP management. Section 3 gives a brief introduction of the bibliometric techniques adopted in this study. Section 4 provides further details on the data and methodology. The results and discussions are presented in Section 5. Section 6 concludes with the major findings of this paper and suggestions for future research.

2. Literature review

The process of intellectual property management is the means through which companies or individuals maintain their patents, trademarks, copyrights, and trade secrets. Activities involved in this process can be as simple as obtaining IP rights and keeping them renewed, or as complicated as developing an integrated IP strategy and aligning it with business strategies [7]. The most important objective of IP management is to ensure that all intellectual property is being used to its fullest extent and serves to maximize profitability [11].

Several studies have analyzed and reviewed the IP management research. Previous review papers summarized various research topics related to IP management and depicted the current status of IP management as a field of study within management. In one of the earliest review papers on IPM, Hanel [9] surveyed the IPM literature and classified IPM studies into different groups based on their primary focus. After a careful review of the existing IPM literature, the author came to the conclusion that intellectual property is becoming an increasingly important business asset for firms. Swain and Panda completed a bibliometric study on 332 articles published in the *Journal of Intellectual Property Rights* from 2002 to 2010. The results indicated that the degree of collaboration in the journal was relatively low, with nearly three quarters of the articles having a single author. In addition, it was found that the articles were rarely cited and the majority of the citations came from the source journal. Nevertheless, the *Journal of Intellectual Property Rights* is recognized by scholars around the world and is becoming a promising journal in the field of IP management [10]. In 2012, Hanni, Birgitta, and Ulla-Maija wrote a review paper on IPR

studies in innovation management research. Their paper covered 111 articles from seven leading innovation management journals. Similar to Swain and Panda's paper, both descriptive statistics and qualitative observations were reported. Moreover, this review article provided suggestions for future IPR research. In particular, the authors pointed out that research methodologies used in future IPR studies should be more versatile and more studies should be conducted in Asian contexts [5]. Another frequently cited qualitative review was done by Somaya in 2012. The author provided an overview of patent strategy and management research. According to his framework, firms generally adopt three different kinds of patent strategies, namely proprietary, defensive, or leveraging strategies [4]. Most of the source articles analyzed in this paper were from the management literature and investigated firm-level strategies in managing IP.

In sum, previous review papers on IP management either adopted a qualitative approach or focused on a select part of the literature. As a result, there is still little agreement among scholars on what exactly constitutes IPM research. In this paper, we aimed to address the gap in our understanding of IPM research and how the underlying knowledge structure has evolved over time. We achieved this goal by using standard bibliometric techniques, including citation and co-citation analysis. In order to avoid any bias in the selection of articles, we broadly searched for all IPM research papers using two databases. A comprehensive list of IPM articles was constructed upon which further bibliometric analysis was performed.

3. Bibliometric techniques

The term “bibliometrics” was coined by Alan Pritchard in 1969 and refers to the application of mathematics and statistical methods to books and other media of communication [12]. Since its introduction, bibliometrics has been adopted by scholars in various fields to quantitatively analyze scientific and technological publications. Common bibliometric techniques include citation analysis, co-citation analysis, and bibliographic coupling. In this paper, we adopted the former two methods to reveal the underlying structure of IPM research.

Citation analysis is based on the rationale that authors cite papers they consider to be important to the development of their own research. Therefore, heavily cited articles are likely to have a greater influence on the subject than less cited ones. Based on the citation rates of the references, we were able to identify the core literature upon which the research field was developed. However, citation analysis alone cannot provide a clear view of the structure of a field [13]. Therefore, in this paper, co-citation analysis was carried out following the citation analysis.

Co-citation is defined as the frequency with which two items of earlier literature are cited together by the later literature [14]. Since its introduction in 1973, co-citation analysis has been applied to various fields of research including information science [15], strategic management [16], operations management [17], human resource management [18], etc. According to the definition, if two papers are strongly co-cited, a large number of authors must cite the two earlier works together [14]. Therefore, by measuring co-citation strength, we measure the intellectual connections within the field [19]. Moreover, in order to be frequently co-cited, the two papers must have been frequently cited individually. Therefore, highly co-cited papers are likely to represent the key concepts, methods, or experiments in a specific field [20]. Consequently, by conducting a co-citation analysis, we can uncover the intellectual structure of a research field [21].

There have been heated debates over the two different bibliometric methods over the years [22]. Bibliographic coupling, which

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