



The role of IT for managing intellectual property – An empirical analysis

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The effective management of intellectual property (IP) is an increasingly complex challenge in today's global knowledge economy, especially for firms with large IP portfolios. Although information technology (IT) tools are a means to support the management of these portfolios, there is little insight in how firms actually make use of IT tools in this regard. Hence, this article analyzes how and for which processes firms use IT tools to support their IP management. Based on a data set of 106 IP intensive firms worldwide, we find that firms use at least one of three major IT tools for IP management: search tools, administrative tools, and evaluation tools. We also find that the use of IT for IP processes is decreasing along the IP value chain: firms use IT mainly in the early IP generation phase, e.g., for absorbing technological developments. The article concludes by outlining where and how IT tools can improve the management of IP.

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1. Introduction

The number of intellectual property (IP) right applications has been constantly growing over the last century. Since 1985, the annual patent filings worldwide have more than doubled; a similar trend can also be observed with trademarks and industrial designs [1]. This accumulation of intellectual property – and thus the growth of the firm's overall IP portfolio – poses several challenges on the effective management of IP. Firms with large IP portfolios are more than ever challenged to design strategies and to implement structures and processes to enable an efficient IP management. Towards this backdrop, dedicated IT tools which are capable of storing, structuring, and making IP information accessible may represent an important efficiency gain for the firm's IP management. Many firms with large IP portfolios such as IBM or Infineon have already established IT systems for managing their IP. However, there is a lack of insights with respect to where exactly IT tools are used in the management of IP, and how firms can use these tools to increase their IP management effectiveness. This article aims to provide answers to this question by presenting the results of a worldwide survey on IP management and IT support at the firm level. Towards the backdrop of managing IP, we define IT tools to

span everything from specific IP based applications to general IP data bases.

The paper is structured as follows. The next section gives an overview of literature on IP tools for IP management. Section 3 describes the research framework and the methods applied for the investigation and provides information on the analyzed sample. Section 4 depicts the findings on the use of IP software which are analyzed in Section 5. Finally, Section 6 summarizes the paper, presents some recommendations on how firms may boost their IP management, and gives a brief outlook for future research.

2. IT tools for IP management – state of the art

Extant literature on IT solutions for IP management can be divided into three major strands, one which focuses on the technical functionality of IT tools in IP management, one which adopts the user perspective of such tools, and one representing the patent offices' activities. In the functional strand, Fabry et al. [2], for example, present a method of using IT tools to evaluate patent portfolios in order to use this information to identify new business opportunities. Bergmann et al. [3] present an IT tool based on semantic analysis to detect risks of patent infringements through patent information. Moehrl et al. [4] analyze major tasks of patent search and identify IT tools that can be deployed to accomplish these tasks. Focusing on the challenge of retrieving relevant information from data bases, Dou [5] presents a possibility to link patent data base search with a dedicated software to filter search results according to specific needs (the author presents the case of

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esp@cenet[®] and Matheo-Patent). This kind of software facilitates search activities and fosters the use of patent information for all user types [5]. Spangler et al. [6] have developed a holistic web-based IP mining tool called SIMPLE that facilitates patent data processing, warehousing, and analysis. Others have investigated data visualization tools which enhance the interpretation and analysis of collected patent information [7]. Based on the experience of a pharmaceutical company, Eldridge [8] gives an overview of selected data visualization tools and their applicability from a practitioner point of view. Moreover, Lupu et al. [9] describe a tool that evaluates the results of different patent information search technologies. They present the TREC Chemical IR (Information Retrieval) Track tool that focuses on evaluating search results of chemical patent information.

In the literature strand adopting a user perspective, Bonino et al. [10] analyze the functionality and user needs of current patent information tools including data bases, search tools, benchmark tools, and semantics-based tools. They find that the requirements on these tools depend firstly on the user type, e.g., patent specialists or managers, and secondly the objective of the patent information activity, e.g., technology scouting or patent monitoring. Radauer and Walter [11] adopt an SME (small and medium-sized enterprises) focus and discuss, based on a benchmarking study of 72 IP services in the EU-27 countries, the gap between the need of SMEs for patent information and the existing patent information services in the European Union. They find that SMEs need more than mere technical patent information and especially require support in the interpretation of the search results. In the light of data base search, Emmerich [12] investigates the level of information of different patent data bases and analyzes in a case study of the pharmaceutical industry how firms can generate high quality search results of a patent search. The results emphasize the necessity to search all high information level patent data bases in order to provide high quality results.

Finally, also patent offices increasingly integrate IT solutions into their service systems. For example, the World Intellectual Property Office (WIPO) developed the online filing system PCT-SAFE (Patent Cooperation Treaty – Secure Applications Filed Electronically). The software was launched in 2004 and enables inventors and firms from all PCT member countries to file their PCT patent applications electronically [13]. More recently, the WIPO also launched an online tool for filing trademark applications and searching internationally registered trademarks via the Global Brand Database [14]. The European Patent Office (EPO) offers with EPO Online Services a comprehensive online service portal including the PatXML software for online patent filings, and Register Plus and WebRegMT (for details see Rogier [15]) for IP monitoring and search activities. Furthermore, EPO provides patent organizing systems and an online fee payment tool.¹ The Swedish and the Australian Patent Office have gradually improved their online services over the last years and recently replaced their old patent data base systems by new online and freely available systems [16,17]. Furthermore, with the Centralized Access to Search and Examination system (CASE), the IP offices of Australia, Canada and the United Kingdom as well as the WIPO have started a pilot system that facilitates the online search of the participating IP offices [18].

However, while extant literature has mainly focused on the technical functionality of e.g., searching for IP and extracting valuable information from patent information, the investigation of the user perspective, i.e., how and to what extent the users deploy IT for all IP management activities, starting with technology scouting and ending with divestment decisions, is

under-researched. Firms' IP management focus increasingly shifts from the traditional defensive approach to a more proactive approach of exploiting the IP portfolio [19–21]. Thus, effectively leveraging IP information in order to identify new technology areas, new business opportunities, or to assess the value of the portfolio is an important part of modern IP management [10]. The field of application of IP software extends from mere search activities to the evaluation and external exploitation (i.e., out-licensing and sale etc.) of IP. Therefore, this paper adopts a user perspective and investigates how and for which processes firms use IT tools to support their entire IP management.

3. Research methodology

3.1. Research framework

Intellectual property rights are the most visible form of intangible assets and are therefore defined as explicit knowledge assets [25]. Hence, managing intellectual property constitutes a specific form of knowledge management. Knowledge management literature distinguishes between *creating* knowledge and *appropriating* returns based on this knowledge as major steps for firms to gain competitive advantage [25,26]. From an IP management perspective, these activities can be reflected in the *generation* of IP, i.e., creating ideas and protecting them through IP rights, and the subsequent *exploitation* thereof to appropriate returns, either internally through securing own products, or externally through, for example, licensing [27]. Furthermore, IP management literature emphasizes the importance of valuating IP within the IP management process [28]. Due to its impact on the firms' decision making, IP valuation is seen as a central activity of IP management, especially in preparation of the commercialization of the IP [29,30].

Thus, drawing on the contributions from knowledge management and IP management literature, we identify three core phases for managing intellectual property: *Generate*, *assess*, and *exploit* IP. We will call this the IP value chain model.

The first phase, *IP generation*, includes the idea finding and realization process as well as the IP registration. This phase is characterized by a strong technology focus mainly resulting from R&D outcomes and is driven by technology search activities. In a first step, potentially relevant technological fields are scanned broadly via, e.g., patent data bases, including also cross-industry searches. In a second step, the IP search is narrowed focusing on the identified relevant areas [31]. Also the patentability of new technologies and the freedom to operate is checked in this phase. Ensuring freedom to operate, i.e., creating and maintaining a position through IP rights where the firm can continue its research and development in the specific technological field free from third party IP rights is a crucial aspect of generating new IP [32]. Based on the search and idea generation, IP right applications are filed with respect to the firm's IP strategy. Blind et al. [33] state that besides the traditional and still major reason for patenting *protection from imitation*, strategic motives such as blocking competitors, enhancing firm reputation, and improving the firm's negotiation position are becoming increasingly important and thus are increasingly taken into account by firms when defining their IP strategy.

In the second phase *assessing IP*, the IP portfolio or single IP rights are assessed to obtain a qualitative or quantitative value, mostly applied for patents. While the quantitative *valuation* approach aims to give the patent an absolute value in terms of money, e.g., for balancing, tax, enforcement, or commercialization reasons [34], the qualitative *evaluation* of IP stresses the strategic value of a patent such as its legal strength or relative importance in its technological area [35,36]. The evaluation of IP also includes IP

¹ Information under www.epoline.org.

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