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Getting the most out of your IP – patent management along its life cycle

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Effectively managing and optimizing the value of the patent portfolio is a major challenge for many firms, especially those in knowledge intensive industries, such as the pharmaceutical, biotechnological and chemical industry. However, insights on effective patent portfolio strategies are rare. Therefore, in this article we investigate in detail how firms successfully manage and optimize their patent portfolios to increase their overall competitiveness. We discover that successful patent portfolio management is rooted in managing the patents along their life cycles. Based on the findings of ten case studies, we develop a holistic patent life cycle management model reflecting five distinctive phases of patent management: explore, generate, protect, optimize and decline. We conclude with how our findings can be used in practice.

Introduction

Intellectual property (IP) has moved from a legal matter to a strategic issue [1]. Research and practice have recognized IP as a crucial part of corporate strategy [2,3] and a main source of competitive advantage [4]. This has been underpinned by the growing number of patent applications over the past century. Since 1985, the worldwide yearly patent filings have more than doubled and in 2009, 1.85 million patent applications were filed worldwide [5]. Most of the patent applications were filed in the USA with 456,106 patent applications, followed by Japan with 348,596 and China with 314,604 patent applications. At the European Patent Office (EPO), 134,580 patents were filed in 2009. These numbers show that firms have increasingly accumulated patent rights and therefore are challenged to manage their growing patent portfolios effectively. With the long product cycles in the pharmaceutical, the biotechnological, and the

chemical industry, patents are an important instrument for maintaining a competitive advantage through temporary monopolies and are a major means of appropriating increased returns on investment [6,7]. Many successful firms, such as Dow Chemical (<http://www.dow.com/>), Roche (<http://www.roche.com/index.htm>), Novartis (<http://www.novartis.co.uk/index.shtml>), and Bayer (<http://www.bayer.co.uk/scripts/pages/en/index.php>) have established well-structured IP management processes and organizational structures and consider IP as a major corporate asset. Despite the increasing importance of IP management in literature and practice, insights in how firms manage their patents from a holistic, strategic perspective, and how the portfolio value of patents can be optimized, are scarce.

Smith and Hansen [1] split the strategic management of IP in the activities IP generation, protection, and valuation and argue that firms must ensure that these activities are aligned with

business strategy. Carlsson *et al.* [8] conducted a case study research with 15 technology-based firms from the USA and developed a general IP management process consisting of the phases pushing for strategic IP, inventors' activities, screening techniques and checklists, and, finally, patent prosecution. In a study on new technology-based firms Lynskey [9] based his research on a classic value chain model and applied this to the IP generation process. The developed IP value chain model comprises the following steps: conception, primary document, review, formal document, legal document, patent prosecution, and IP portfolio [9]. However, all these IP management frameworks finish with the application of the patent rights, and a description of a more comprehensive patent management model is missing. To find out how a more holistic model could look like, we conducted 36 semi-structured interviews with ten firms from the pharmaceutical, biotechnological, and

TABLE 1
Overview of the investigated firms

Firm	Industry	Turnover	Patents
Roche	Pharma	>35 billion EUR	53,000
Novartis	Pharma	>30 billion EUR	25,000
Bayer	Pharma	>30 billion EUR	78,000
Beiersdorf	Pharma	>8 billion EUR	2580
Henkel	Chemicals	>13 billion EUR	8000
Kodak	Chemicals	>5 billion EUR	>20,000
Sika	Chemicals	>3 billion EUR	1600
Prionics	Biotechnology	>25 million EUR	–
Cytos	Biotechnology	>5 million EUR	450
Biotronik	Biotechnology/Medical Devices	–	–

chemical industry (Table 1). The firms were chosen because they are all characterized by well-structured IP management processes and organizational structures and thus provided the most detailed and insightful information.

The persons interviewed were upper managers responsible for the firm's IP and R&D management. Based on the findings of our interviews we argue that the management of patents should not stop with the filing of the patents but that it should be better linked to the innovation process of a technology.

The patent life cycle management model

The analysis of the case studies revealed two major findings. First, we found that successful patent management follows technology management, that is, the firms' patent management is strongly oriented to the life cycle of technologies starting with the discovery of ideas until a product is discarded from the firm's portfolio. Based on this, we identified five distinctive phases that reflect the patent life cycle management of the firms following the technology life cycle, these include: explore, generate, protect, optimize and decline. Second, the findings suggest that the way patents are managed largely depends on the patent's strategic value and the firm's internal resources. The patent's strategic value refers to the strategic value of the technology or patent relative to existing markets, competitors and substitution technologies. The strength of internal resources refers to the firm's assets, such as employees, know-how, and experience regarding a certain technology. While in the first two phases (i.e. explore and generate) the firm accumulates new competencies about a new technology, these competencies remain at a high level in the phases protect and optimize. This is true even for the decline

phase, although here, the firm might decide to discard the patent. Thus, our framework displays patent life cycle management as a function of strategic impact and internal resources available in which each phase addresses three core dimensions of patenting: freedom to operate, differentiation from competitors, and external patent exploitation (Fig. 1).

Explore

In the first explore phase, the firms collect ideas for new inventions. The strategic impact is still low or unpredictable and technological trends are explored through broad cross-industry patent searches for example, patent scanning. Also the patentability of existing technologies and the freedom to operate is simultaneously checked during these patent scanning activities. In addition, the strategic positioning of the firm, with regards to potential future cross-licensing opportunities to enhance the access to external knowledge, is considered. For example, Prionics (<http://www.prionics.com/>) follows the strategy that a new project always starts with a comprehensive patent search. For each new project Prionics compiles an individual search profile, often with the help of external experts like the national patent and trademark office. The patent monitoring is conducted on a monthly basis with the databases of Medline and Derwent. During this search, 400–500 potentially relevant literature citations and 75–120 potentially relevant patent citations are identified. In a second screening, an internal group of experts, consisting of R&D project leaders and product managers, evaluates the search results and filters 30–50 relevant literature citations and 10–25 relevant patent citations. This kind of search process is successful at Prionics and has been established as an integral part of new product development.

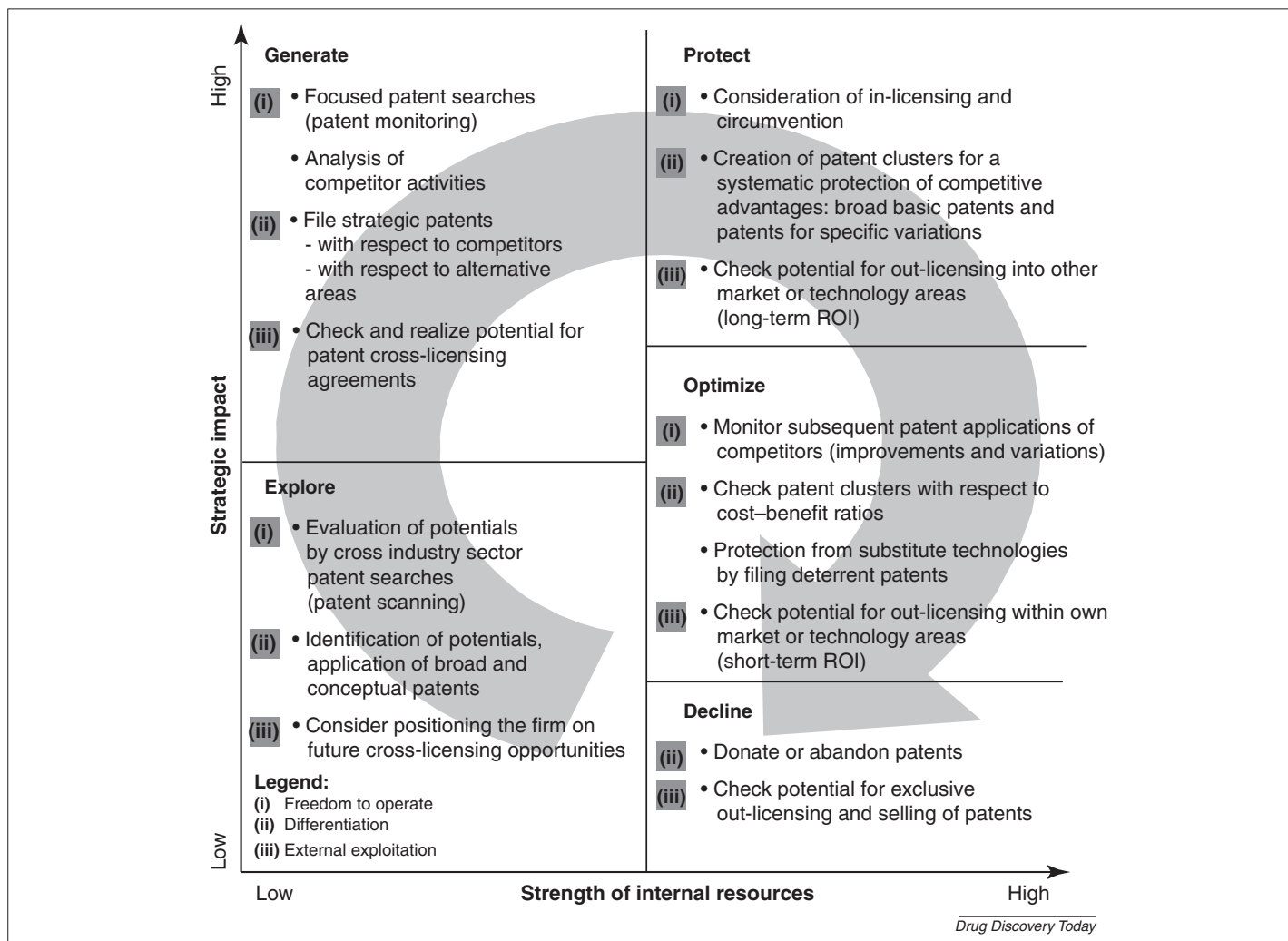
Generate

The exploration activities are succeeded by the generate phase where ideas are realized through the development of new products. At Henkel (http://www.henkel.co.uk/cps/rde/xchg/henkel_uke/hs.xsl/index.htm), for example, the strategy for its core competence areas is to strive for an exclusive protection of its products, technologies, packaging and substances. Inventions in non-core competence areas often are not protected through patents but are published (e.g. in professional journals to prevent potential patenting of competitors). Cytos' (<http://www.cytos.com/>) strategy is to identify and patent new specific substances as early as possible and to partner with large pharmaceutical companies for further clinical development. Key aspects for Cytos are the maximization of the cost-benefit ratio and ensuring an appealing patent portfolio for partnering with large pharmaceutical companies.

Also, firms increasingly open up their research processes and acquire external technologies to complement their own technology portfolios [10,11]. In our cases, Roche's research and development network, Bayer's engagement in cross-licensing, and Biotronik's strategy to in-license technology are ways to complement internal know-how. Also Henkel, although the company is rather reluctant to open its innovation process, uses cross-licensing agreements with cooperation partners for specific parts of the portfolio. In these cooperations, Henkel aims to avoid financial compensations but tries to agree on a patent exchange based on the quality of the patents.

Protect

The protection phase is characterized by high strategic impact and strength of resources. The firms have accumulated comprehensive know-how in a field of competence with a high level of strategic importance. The potential for filing broad basic patents is declining since public knowledge in these fields has already greatly increased. The patent applications now focus increasingly on more detailed, specific embodiments, often with the motivation to build patent fences around a core invention to foreclose patenting of substitutes by rivals [12]. Therefore, the firms increasingly seek to create patent clusters in strategically important fields of technology. This involves generating patent portfolios that have a broad sweep but which later, when it is easier to estimate which ideas are technically and commercially viable, are thinned out again. Roche for example continuously builds up patent clusters by filing patents for

**FIGURE 1**

The patent life cycle management model. *Abbreviation:* ROI – return on investment.

back-up compounds and follow-on patents to enhance the protection of their products. Approximately 1–10 basic patent applications and patents for back-up compounds are filed per project. During the clinical development and early commercialization phases, approximately 3–30 follow-on patents are filed. Follow-on patent applications include for example patents for polymorphs, salts or alternative formulations.

Optimize

In the optimization phase, the firm has a high level of competence in the respective technological field but the strategic importance with regards to customers, markets, competition or technology is declining. The firms monitor competitors' patenting activities and review their own patent clusters thoroughly in respect to cost-benefit considerations. For example, a potential reduction of the territorial coverage of the patents is checked regularly. Also the risk of

substitute technologies is analyzed. If there is a risk of competencies being replaced by substitute technologies, the firms' own patents in these fields can be used as blocking property rights to prevent a decline in value of the existing core technologies.

For research-based pharma firms, the risk of infringement especially emanates from generic drug companies. Generic drug companies are becoming competitors when the relevant patent's expiry day approaches. Approximately five years before the generic companies are able to legally enter the market and use the specific agent, Novartis, for example, performs active competitive intelligence to identify potential infringement. Because generic companies can start regulatory readiness before the innovator exclusivity period has expired, Novartis keeps an active eye on all developments of 'their' products. The first assessment is undertaken in the preclinical phase, further

assessments take place at the entry of each development phase.

Decline

When the strategic importance of a technology or competence has greatly declined, the corresponding patents are reviewed to determine whether they still add value to the firm and to define the divestment strategy. Before the patents are abandoned, the firms check the patents for out-licensing, selling or donation opportunities. Biotronik evaluates, in a yearly review, its patent portfolio and decides on how to proceed with obsolete patents. The IP review board, supported by R&D and management, is responsible to assess obsolete patents with regards to an external exploitation through out-licensing. They check if the patent protects one of Biotronik's products or if its internal exploitation is planned in the future. Furthermore, they analyze whether competitors could potentially

use Biotronik's patents for their technologies and also whether the patents could be enforced in case of an infringement. Finally, the overall costs and efforts are estimated before Biotronik decides on licensing or abandoning the patents.

Concluding remarks

We have explored how firms from the pharma, biotech, and chemical industry manage their patents from a strategic perspective and we suggest a holistic patent life cycle management model for an efficient management of IP. The key message is that patent management should not be regarded as an isolated function but as an integrated activity that considerably contributes to firm success, because intellectual assets have become crucial firm resources. Firms should therefore take a holistic view on their patent management, considering the following:

Identifying new technological challenges is an important factor to create innovation. Thus, firms should establish active technology scouting and patent scanning processes. The earlier technological trends are found the better the firm can react and reach a first-mover advantage. It is especially important that these technology scouting and patent scanning activities are conducted and updated on a regular basis. Also, firms should ensure that the respective employees (e.g. R&D employees, patent managers and business developers) are given access to the results.

During the development of new technologies and products, it is important to keep an eye on competitor and market activities. Firms should therefore establish a patent monitoring system that regularly observes the firms' environment. Special attention should be paid to identifying substitute technologies because they might weaken the firm's temporary monopoly gained through the patent protection.

External leveraging of patents (e.g. through out-licensing, cross-licensing, sale, strategic alliances and joint ventures) might enable firms to generate additional returns on investment and

to induce strategic benefits. Therefore, considering external exploitation opportunities at all stages of the patent life cycle should be a standard activity of patent management.

Firms are advised to conduct regular (e.g. yearly) patent audits where the value of the patent portfolio is assessed. These audits should also be used to keep an overview on how each patent is exploited, that is, which patents protect which products or technologies, which patents have a blocking function, which patents are out-licensed and to whom, and also which patents are currently not used for any competitive advantage or financial benefit. Based on the audit, decisions on when and where new patents should be filed and which patents could be out-licensed to generate additional income can be made and further steps for implementing these activities can be defined.

Issued but unused patents cause unnecessary maintenance fees. Hence, firms should make proactive patent divestment decisions to avoid the accumulation of unused patents. First, potentially obsolete patents should be evaluated and balanced with regards to the benefits and costs for the firm. If the patent reveals potential attractiveness for other firms, out-licensing, sale or donation should be considered.

Finally, patent life cycle management should be considered as a holistic and interdisciplinary task. Thus, the above mentioned recommendations should be implemented by a small group of senior executives, consisting of heads of IP, R&D, business development, product development and marketing.

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