



The Patent Asset Index – A new approach to benchmark patent portfolios

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ABSTRACT

Patent metrics are increasingly used to assess the competitive position of technology-oriented firms. Patent rankings and patent scoreboards are popular methods to benchmark patent portfolios of firms against each other. Existing rankings, however, have methodological limitations that significantly reduce the meaningfulness of these benchmarks for managers, investors and other stakeholders. In this paper, we develop a new benchmarking methodology that overcomes limitations of existing approaches and offers a more accurate assessment of a firm's patent portfolio vis-à-vis its competitors. Firms are ranked according to the Patent Asset Index, which is derived from a set of newly developed patent indicators. These indicators are empirically validated and reflect more accurately the value of patents. We apply the new benchmarking method in the global chemical industry and contrast our findings with those of other existing patent portfolio rankings.

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1. Introduction

The majority of technological improvements that companies believe to be patentable and important are documented in patent applications [1–4]. Benchmarking patent portfolios therefore promises to objectively compare the technology strength of companies. Because proprietary technology is a cornerstone of market success and a valuable asset in many industries, patent benchmarks provide useful insights into the competitive position of a company [5–8]. As patents usually precede the actual use of technologies in commercial applications [9], these benchmarks can also offer an outlook into tomorrow's competitive landscape.

Patent rankings and patent scoreboards are therefore popular methods to benchmark patent portfolios of firms against each other. The Wall Street Journal, e.g., has been regularly publishing these patent benchmarks for multiple industries. These patent rankings receive increased attention from managers, investors and the general public. A number of firms, e.g., DuPont and Halliburton, use these benchmarks to signal their innovativeness and leading competitive position to investors [10–12].

Existing patent rankings or scorecards have methodological shortcomings regarding the quantitative and qualitative assessment of patent portfolios. The Wall Street Journal ranking, e.g., has a focus on US patents. This approach does not adequately reflect patenting activities by foreign firms and further neglects

the importance of global patenting activities. The metrics used in these benchmarks to assess patent quality are dated because they do not incorporate recent advances in the development of more meaningful patent indicators that reflect the technological and commercial value of patent portfolios more accurately [13,14].

Assessing the value of patents is the most critical element of any patent portfolio benchmark since simple patent counts are an insufficient proxy of patent strength, innovation or competitive impact [7,8]. It is well-known that the majority of patents has little or no value [15–18]. According to a recent study by Gambardella et al., less than 20% of granted European patents are worth more than 3 million Euros [15]. Yet, these patents account for more than 90% of the total financial value of all granted European patents examined in this study [15].

In this paper, we develop a new benchmarking methodology that overcomes the limitations of existing approaches and offers a more accurate assessment of a firm's patent portfolio vis-à-vis its competitors. Firms are ranked according to the newly developed Patent Asset Index, which is derived from a set of new patent indicators. These indicators are empirically validated and reflect the value of patents more accurately. We apply the new benchmarking method in the global chemical industry and contrast our findings with those of other existing patent portfolio rankings.

2. Discussion of existing benchmarks

The assessment of smaller patent portfolios can be done by applying in-depth expert valuation techniques. In the case of larger patent portfolios, however, existing benchmarks have to rely on

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other indicators. For the reasons outlined above, merely comparing the quantity of patents is not sufficient to value the competitive impact of patent portfolios. Most patent benchmarks thus evaluate patent portfolios by calculating a patent quantity measure that is then multiplied by a measure of average patent quality. The quality dimension is typically derived from certain patent indicators such as citations. The existing benchmarks use US patent data only, both for calculating the quantity and quality measures. The methodologies differ, though, in the exact way patent value is estimated.

Some companies select and weight value indicators based purely on their statistical correlation to patent maintenance rates [19] or other correlates of patent value. This mathematical approach has the practical benefit of requiring no patent expertise to select value indicators. However, mere statistical correlation can be misleading when there is no solid theoretical and conceptual foundation [20].

Scientists and some consultancies use value indicators substantiated by validation studies [21–26]. We will discuss in more detail the patent benchmark published by The Wall Street Journal (see, e.g., [27]) as its foundations are documented in scientific publications from the 1980s [21] to 1990s [22,28].

The Wall Street Journal's patent benchmark is provided by the consultancy The Patent Board. It exclusively relies on US patent data. This is problematic for a comparison of international companies, because it may lead to a strong overestimation of the patent strength of US-based companies compared to companies from abroad [13,14]. Some large Japanese companies, e.g., only file US patent applications for less than 10% of their inventions [29]. The share of the patent portfolio that is visible in US patent data varies greatly among companies. Just 25% of all worldwide inventions are recorded in US patent data [29].

The Patent Board's analysis is restricted to US patent grants from the past 52 weeks. Taking into account both the geographic and temporal limitation, we found that only 0.5–10% of the actual patent portfolio of large multinational enterprises is therefore considered in this benchmark [29].

Only patent grants but not patent applications are taken into account. Patent grants are delayed by the substantial time needed for patent examination. Most patents granted by the United States Patent and Trademark Office (USPTO) in 2008 were filed at least 3 years earlier, 25% had even been first filed more than 5 years earlier [29]. Patent applications are a more up-to-date measure of inventive activity.

A company's position in the patent ranking by The Patent Board depends on the indicator "Technology Strength", which is the product of the number of patents granted by the USPTO to the company during the last 52 weeks, divided by four and multiplied by the patents' average value as measured by the indicator "industry impact". Industry impact is based on the number of citations which the company's US patents have received from other US patents over the last 12 months [28]. Patent citations are valid indicators of patent value [21–26]. Limiting the data to twelve months of US citations, however, means missing out on most of the information that is available worldwide to measure a patent's impact.

The Patent Board's patent benchmark ignores the validity of patents in world markets. Nowadays, most companies compete globally. The US only accounts for 25% of the world market in terms of Gross National Income [30]. Thus, the total value of a patented invention critically depends on whether patent rights in other important markets such as Europe or Asia have also been secured. None of the existing benchmarks considers the worldwide legal status of the patents. Further, they fail to assess the global market impact and relevance of a firm's patent portfolio.

In conclusion, the following limitations of the existing benchmark methodologies exist:

- US-centric approach neglecting global patent portfolio positions.
- Focus on granted patents neglecting recent changes of patent portfolio positions.
- Use of rudimentary indicators of patent value, esp. the current extent of patent protection in world markets – a critical determinant of patent value – is neglected.
- Incomplete.

3. Developing a new patent benchmarking method

The aforementioned limitations can be overcome. In order to correctly compare international firms, worldwide patent data should be used. The entire patent portfolio of all companies can be identified by retrieving patent data for all relevant countries worldwide from the respective databases. To analyse the extent of patent protection in global markets, international patents coherently protecting the same invention can be grouped into patent families and their respective legal status can be verified. In addition, recent inventive activity is evidenced in patent application data: patent applications are usually published 18 months after filing and often represent the first public disclosure of an invention [31]. Finally, disclosing how the metrics are calculated helps to create a transparent methodology that investors, managers and other stakeholders can understand and trust more easily.

We created a new benchmarking methodology along these general guidelines for improvement. In the following, we discuss our methodological approach in more detail: First, we elaborate on how patent 'portfolio size' can be measured to accurately reflect the entire and current worldwide patent portfolio of a firm. Second, we discuss new and better ways to assess the value of a firm's global patent portfolio. Here, we focus on two innovative indicators: 'market coverage' and 'technology relevance'. 'Market coverage' is a measure of the extent of patent protection in global markets. 'Technology relevance' is a new citation-based indicator to assess the technological impact of patents, which eliminates systematic distortions of existing citation-based patent indicators. Third, we combine 'portfolio size', 'market coverage' and 'technology relevance' to construct the 'Patent Asset Index' as our new key metric to assess the value of a firm's patent portfolio. Finally, we conduct an empirical analysis to cross-validate the new indicators used in the 'Patent Asset Index'.

3.1. Portfolio size

We define 'portfolio size' as the number of granted and valid (active) patents at a specific point of time when the ranking is done. We further add the number of patents under examination. Published pending patent applications are included because they offer some level of protection. Competitors know that the majority of all patent applications lead to a granted patent so they are discouraged to invest in the exploitation of the invention before the patent offices make their decisions [32]. In short, 'portfolio size' can be described as the number of active patent families a company owns (see below).

To consider the entire patent portfolio of companies, patent publication data from all (or most) worldwide patent offices from at least the last 20 years – the maximum regular lifetime of a patent – has to be integrated. Using this dataset creates a variety of new challenges, including the identification of international patents covering the same invention and tracking patent ownership over time. As 'portfolio size' reflects the number of active patents and published pending applications, the legal status of all patents applied for during the last 20 years must also be tracked in order to exclude, e.g., all lapsed patents and rejected applications from the analysis.

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