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Using Patent Data for Strategic Planning

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Managing intellectual property is a key issue in the management of technology. Two interesting perspectives are presented here: How patent data can help determine competitor strategic directions and technological strengths, and the role and limitations of patents in transferring technology to the developing world.

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Director

The Internet makes it easy to dig up financial and product information about competitors. For example, no longer is it a chore to obtain 10-K data on public corporations, now that the SEC publishes this information on the web. The same can be said about product lines. Have you checked your competitors' web pages lately? More likely than not, there are product descriptions and press releases galore.

But what if you want to try to gauge the R&D effort of a competitor in a certain area of technology, or evaluate the technological strength of a potential acquisition? While R&D expenditures are often included in financial data (often to be found on the web), these data are nearly always aggregated, so you can't tell from the financials where a company's R&D emphasis lies or how that emphasis is shifting. Besides, one person's R&D is another person's tech support, so R&D expenditure data can be misleading. And what if the company is private? Then even the financial data can be hard to come by. Of course, one can always ask around, and try to piece together bits of anecdotal evidence. All too often, this subjective approach yields an incomplete and often questionable picture. So, is there a reliable way to successfully "peek under the tent flap" at R&D activity?

Patents as a window to R&D activity and strength

There is a more objective way to approach the question. The information is in the public domain, is well organized and objective. The answer is patent data.

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In return for an inventor disclosing an invention to the public, the government grants the inventor a monopoly to exploit his invention for a number of years. The public disclosure is in the form of a patent document, a legal form which is bound by a set of exacting requirements. Patent data reveal who is inventing in a given area of technology, who they work for, whose "prior" work was built upon, and whether that work was patented or appeared in a scientific journal.

You may ask if it is safe to assume that a large part of technology is patented. Of course trade secrets are not disclosed in patents, and in a few industries these may be important. But, patents are given increasing weight in the courts; and there is always the possibility that a competitor might obtain a patent that would make a trade secret irrelevant. So increasingly, the emphasis is on obtaining patent protection, rather than relying on trade secrets. The climbing rates of patenting here in the U.S. and overseas show how important patents have become.

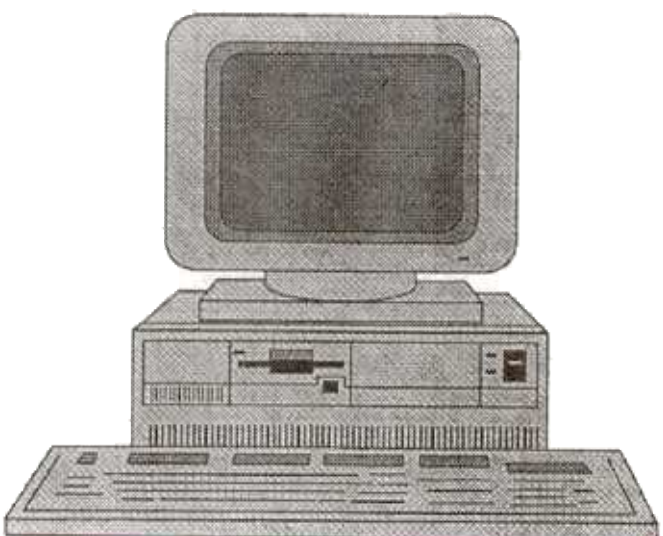
Thus, patents provide information on R&D that goes beyond the available financial data on total R&D spending of public companies. In the US alone nearly two million patents are currently in force (about 120,000 new patents were granted last year), and patents come out of all quarters: public and private companies, government agencies, universities and, of course, the garages of many individual inventors. Furthermore, unlike most financial data on R&D expenses, patent data can be disaggregated technology by technology, allowing one to measure shifts in R&D emphasis within an R&D organization.

Companies have traditionally conducted searches of the patent literature, usually as part of the process of applying for new patents or tracking individual patents at the researcher level. This traditional micro-scale use of patents can be summed up in a very familiar image: a stack of patents piled up on someone's desk waiting to be read. While such efforts have been and continue to be important functions within a company, they are rarely useful to the strategic planning process. But, in the last ten or so years strategic use of patent information has evolved as more companies have come to technology analysis consultants or themselves developed customized computerized databases of patent information to develop meso- and macro-views of technology.

Instead of reading and analyzing individual patents, the strategic view is served by developing statistical measures or indicators based on data for groups, sometimes quite large numbers, of patents.

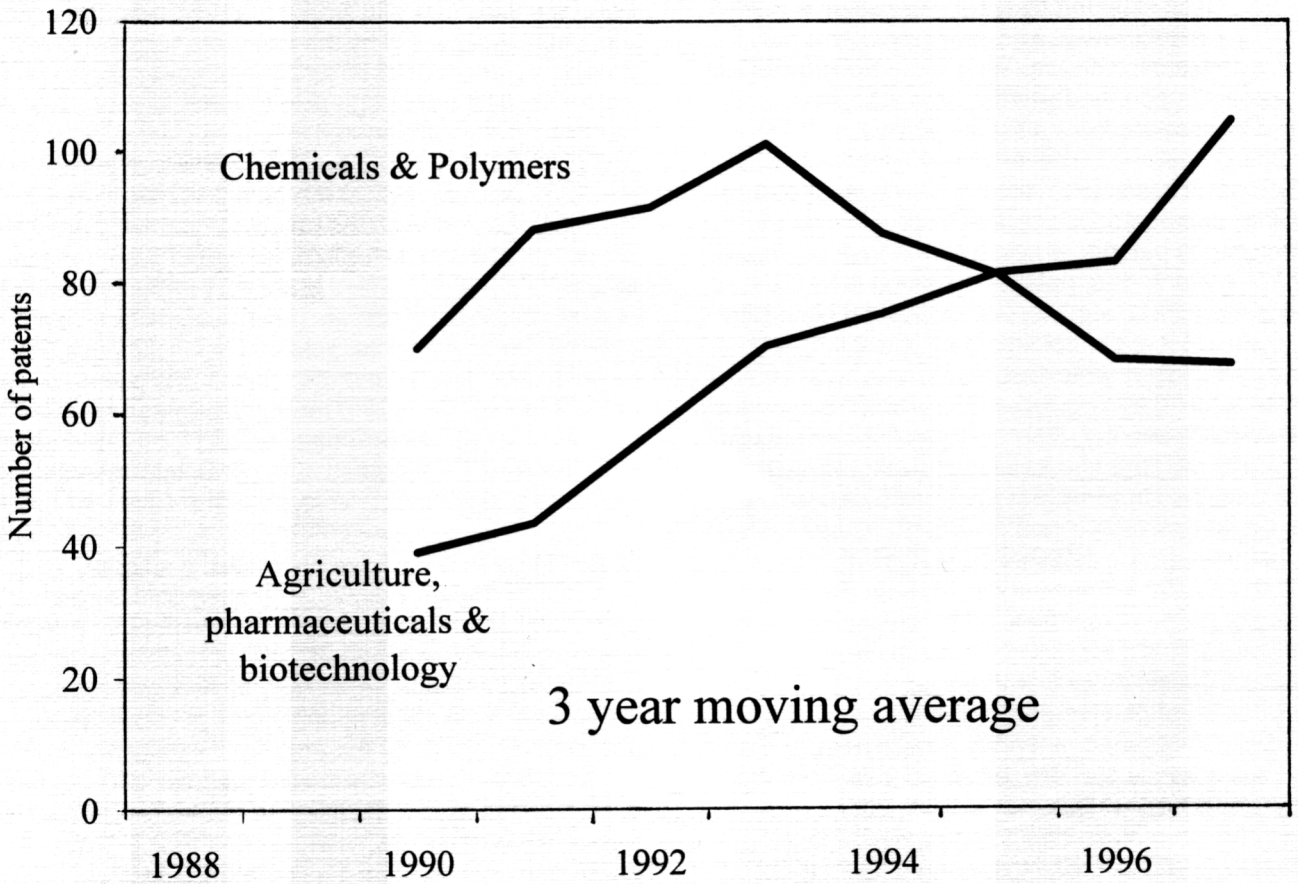
While there are now searchable databases of the full text of patents, one can do quite well working with the information contained just on the first ("front") pages of patents. There you find the patent number and title, a list of the inventors and where they live, who the patent has been assigned to by the inventors (usually their company), and a brief description of the invention (the abstract). The front page also includes one or more of the examiner-assigned 400 invention classifications and over 100,000 sub-classifications, which classify the invention art embodied in the patent. Classification information can often provide a search pathway around the often intentionally fuzzy language of titles and abstracts. And, finally, there is the very important listing of examiner references, documents describing relevant prior art, those earlier patents and scientific papers or other articles that "bound" the claims of a patent. A typical U.S. patent has 7 or 8 references to earlier U.S. patents, 1 or 2 to foreign patents, and 1 or 2 references to the literature. It is these references that form the basis for all patent citation analysis work.

At CHI Research we have developed a suite of "technology impact indicators," based on the front-page citation reference data. These indicators make it easy to compare companies, across technologies, and over time. For example, we can answer the question: "is a company's patent portfolio of high technological quality or impact?" by determining if its patents are cited relatively frequently in later patents. We can find out if a company is innovating as quickly as competitors by measuring how new the cited prior art references are. We can see if a company is in touch with the latest research results by measuring whether its patents reference scientific papers as prior art, thereby showing they are building directly on basic research in contrast to older, patented technology.



Patent Data and Strategic Planning (continued)

Figure 1 - Monsanto shifts its patenting from old to new technologies



Patenting activity as a measure of R&D output

The most basic indicator, of course, is patent counts, used to measure technology activity. Patent count data can be used to identify established and emerging players in specific technologies, and shifting emphasis within individual companies. For example, Figure 1 uses patent counts to show that in the early 1990s, Monsanto began a concerted shift in R&D emphasis, away from a conventional chemical business and into biotechnology driven areas: drugs and agriculture. Monsanto is now positioned as a life sciences company. In the past few years, the change in direction has been much discussed, but in 1994, when it began to be visible in the patent data, this was not the case.

Patent citations can be used to measure the impact or quality of patents

But all patents are not created equal. While patent counts do represent activity, they do not tell you much about the quality of the patenting. The basic citation indicator of patent quality is how many times a patent has been cited in later patents, or, for a group of patents, the citation frequency. Patent citation distributions are highly skewed, with a small number of highly cited patents, and most patents not cited or cited only a few times. Within five years the average patent is cited five times.

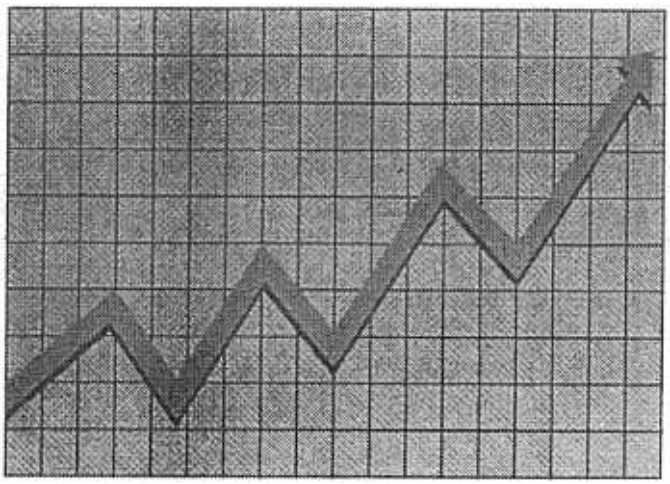
Validation studies have confirmed that when a patent is cited many times, usually more than ten, the patent will most likely be one of high technological impact. CHI has developed several normalized indicators that permit comparison of the citation levels of patents in different years. One, the Current Impact Index (CII), is a normalized citation indicator with an expected value of 1.0. A group of patents with a CII of 1.5 is cited 50% more than expected.

Two sets of CII's that have been of interest in the past year are of Glaxo Wellcome and SmithKline

Patent Data and Strategic Planning (continued)

Beecham who announced, then called off, a merger that would have created the largest pharmaceutical firm in the world. At the time both were touted in the press as having very strong R&D organizations. However, over the years we have been aware of the trials and tribulations of SmithKline's and later SmithKline Beecham's post-Tagamet research pipeline, and we continued to see patent "quality" indicator data suggesting that this company was not nearly as strong in R&D as others, including Glaxo Welcome and Merck. Table 1 compares CII values computed for the last five years for the three pharmaceutical companies. We see that Glaxo's patents are more highly cited than SmithKline's, and, that Merck's patents are more highly cited still.

Company	1993-97
SmithKline Beecham	0.58
Glaxo Wellcome	0.64
Merck	0.96



Patent indicators may be predictive of stock market performance

Science linkage and Current Impact Index have turned out to be key predictors in some exciting research that is about to be published. In cooperation with Professor Baruch Lev and a graduate student at NYU, a set of 400 companies in four industries (chemicals, electronics, pharmaceuticals, transportation and other) were categorized into four groups (low-low, low-high, high-low, and high-high) based on low or high ratings for CII and Science Linkage. The key finding is that companies with high citations and high science linkage had 25% higher stock market-to-book ratios three years out than the low-low companies.

Technological due diligence must not be short-changed in M&A

A few years back, as part of a broad strategic plan to diversify into print/imaging technology, a large technology-driven company acquired a small specialty business. Soon after they completed the acquisition, they discovered that the R&D capabilities of the acquired firm were quite limited, and certainly not consistent with the perception that they had bought a company with strong technological capabilities. If they had bothered to check, they would have found out that all this technological capability was dependent on one key individual, and he did not come along as part of the deal; he was "transferred" to the selling parent company before the sale was completed.

Limitations to the use of patents in strategic technology analysis

The use of patent data requires specialist skill and judgement, and an appreciation that there are limitations. It is very easy to produce fancy looking graphs which are just wrong. The most common reason is carelessness when searching or grouping patents by assignee name, since many companies have patents assigned to them under different names. The German chemical company Bayer owns U.S. patents under over 100 different assignee names, a number of which do not contain the word "Bayer." To find all the patents of J&J one has to look for patents assigned to a number of companies, including Ortho and Ethicon.

A second cause of problems is a badly defined set of patents. Anyone with internet searching experience knows how difficult it is to retrieve information precisely by entering a few keywords joined with some Boolean operators. As the base set of patents underlies all subsequent analysis, it is worthwhile bringing to bear on its construction the expertise of people skilled in constructing sets of patents using sensible and sophisticated methods.

One commonly perceived limit of strategic patent analysis is its historical character. Typically it takes about two years from the time a U.S. patent application is filed until it is granted by the patent office, during which time the patent data is not publicly available. Strategists often want only to see the future and believe the past to be irrelevant to that. But technological innovation is strongly cumulative. Companies build on what they know. Therefore, assessing a company's track record is fundamental to determining its future technological options.

Another possible problem with using patents for strategic purposes is the information versus knowledge issue. It is easier to collect patents and produce a mountain of lists and charts filled with information than it is to produce correct and strategically useful knowl-

Patent Data (continued)

edge. Again, we believe in the value of specialist expertise in knowing where to look and what to look for to speedily and economically produce valuable and useful knowledge from patent based information. There are many ways of working with patents; R&D people use them one way, the legal department another. To this should be added the strategic analysis specialty, skilled in producing analytical quality databases to supply strategists with timely technological intelligence.

Summary

Sometimes you just need to know how your technology development stacks up against competitors, or where the technological strength of an acquisition target lies. To find out, companies large and small use strategic patent analysis. High quality analyses, produced by skilled analysts who are aware of the subtleties and limits of strategic patent analysis, can provide invaluable insights into the details of competitors and indeed one's own R&D and knowledge management. Knowledge management is much discussed these days and is often a slippery term. But one thing is certain: the only way to uncover the tacit technological skills so useful to future technological innovation is to get the skilled person to write something down. In applying for a patent they do just that, and so in patents and the patterns they form, firms reveal some of their deepest secrets to those who know how to extract the knowledge.

Mike Albert is Vice President at CHI Research, Inc. where he has 11 years experience analysing corporate patenting. Diana Hicks is a Research Analyst at CHI working on science and technology policy. She joined the firm this year from the University of Sussex where she was an Associate Professor. CHI has recently developed the Tech-Line database to make patent indicators easily available on line (see www.chiresearch.com).

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