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A strong patent portfolio and a favorable patent environment are two important criteria for the success of an emerging technology business. To check these is the task of patent due diligence. It reveals which obstacles the business's patent portfolio puts in the way of possible imitators and assesses the danger of the business being blocked by the patent rights of others. By clarifying the business's patent situation, a patent due diligence also lays the foundation for formulating a suitable patent strategy.

"Stefan Rolf Huebner discusses the essential concepts of patent review all of us need to be familiar with."

—James E. Schrager,
Clinical Professor of Entrepreneurship and Strategy,
University of Chicago Graduate School of Business

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Patent Due Diligence in Emerging Technology Businesses: *How It's Done—What It Achieves*

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For a new technology venture, patents can be a blessing or a curse—depending on whether they are the business's own patents or those of rival companies. Patents can protect the business from competition in that they grant a monopoly for the patented technology. Rival patents, however, can block the business's access to the market.

Accordingly, the success of the emerging business depends just as much on the strength of its own patent portfolio as on how strongly rivals have already occupied the relevant technical area with their patents. A patent due diligence for an emerging technology business must therefore clarify both matters for interested investors.

The part of the patent due diligence which deals with the strengths and weaknesses of the business's own patent portfolio is known as scope of protection analysis. It answers the question of how much lasting protection the business's own patents offer against the competition. Rival patents, however, are examined by a freedom to operate analysis. It assesses the danger of being hindered by the patent rights of others, but also demonstrates the opportunities that an underdeveloped patent environment could possibly open.

THE SCOPE OF PROTECTION ANALYSIS ASSESSES THE STRENGTHS OF THE COMPANY'S OWN PATENT PORTFOLIO

It is becoming ever more difficult for innovators with a new product to hold their lead over the competition long enough to pay off the development costs. In a more recent survey the average time between the introduction of the new product and the market entry of the first competitor with a comparable product was determined for 46 important product innovations of the 20th century (Agarwal and Gort [2001]). The authors found that the time lead of the first mover company has continually shrunk from almost 33 years at the start of the century to under 3½ years today. That is because many barriers have fallen which once impeded the spread of new technologies; especially secrecy is becoming more and more an illusion, in view of modern reverse engineering techniques, the flood of scientific publications, and the increasing mobility of research and development personnel. Also, the expenditure of time and costs of copying a development has sunk due to the tools and resources that are available to imitators today.

Accordingly, the significance of patents has increased, for they still represent an effective barrier. If protection by patent exists, copying is as a rule no longer an option for the competition, in view of the far-reaching injunction and damages claims which the patentee can make against the patent violator. The competition must therefore design around the patent portfolio by developing its own engineering solutions. Because the development of such solutions costs time, however, patents help technology leaders get a crucial

head start over their competitors. The increased significance of patents is mirrored in the numbers of registrations: today, the number of patents submitted annually to the European Patent Office is double that of 10 years ago.[1]

In order to determine what kind of head start a company's patent portfolio procures, a scope of protection analysis usefully begins by painting as realistic a picture as possible of the company's own position in development as compared to that of the competition: Where do we stand, where do the others stand? What exactly makes up our own technical lead? Only then can one judge whether the patent portfolio protects this technical lead so well that a real head start arises.

The Technical Lead

Although new ideas are often praised as "revolutionary," technical advance goes ahead almost exclusively in small steps: an improved procedure allows for a cost advantage in the manufacture of a product, a change in the construction increases its lifespan, another material enables it to be used in a new application. It is therefore essential first to identify the feature that distinguishes the new product from the technology of the competition. In order to explore the developmental status of the competitors, a look into their patent portfolios can be very helpful, for in almost every country, patent applicants are required to publish their inventions 18 months after the first patent application.[2] Thus these publications reveal what the competition is working on long before the corresponding products come out on the market. Once one has gained an impression of how far the competitors are, a comparison with one's product sometimes leads to the sobering realization that one's own technology doesn't differ from that of the competition as much as one originally thought: what initially appeared to be a breakthrough turns out to be just a me-too.

The Time Lead

If, however, one's own technology truly is unique and promises a real advantage over competing products, the question arises of how durably the patent protects the development from being accessed by competitors. At first glance, a large number of patents seem to promise a lot of protection; however, one should not be blinded by the mere size of a patent portfolio: patents vary. One can estimate that a patent from the top group of the most valuable 5% of all patents has on average more than 20 times the value of one of the remaining patents (estimate based on data provided in Harhoff et al. [1997]). In addition, experience shows that many ideas are patented which stand in no context with a current or planned product. Admittedly such patents can have a value, for example if a licensee can be found; however, they contribute nothing to the protection of the product. The sheer number of patents therefore says little about the portfolio's scope of protection: a small portfolio can be more powerful than a much larger one.

The scope of protection analysis therefore concentrates on the content of the patents, more specifically on the breadth and strength of the patent claims that have been granted or, if a patent is still pending, the claims that are likely to be granted by the patent authority. The advantage that the new technology lends the product, for example a higher performance or lower manufacturing costs, is the yardstick. If the advantage of, say, a new fuel cell lies in its higher power per volume, then the question is: What level of increase in power can the competitors reach with their products before they get into the scope of protection of the patent portfolio? Frequently, a second-best solution to which competitors could switch presents itself along with the patented solution. This solution should therefore also be protected through strategic patents. Complementary products represent a similar situation; for example, if the business plan of a printer manufacturer includes making a large part of its profit with the accompanying ink cartridges, they should also be protected by patent.

In principle, the most effective patents are those whose violation is the easiest to prove. For example, for a new sun lotion, a patent on the product sold, whose composition is normally easily examined, is more useful than a patent on the production technique, which can only be demonstrated with access to the facilities of the rival.

Strong portfolios often also contain patents for consequential technologies arising directly from the initial technology. If, say, a new miniature pump makes it possible to construct a new chip on which complete chemical analyses can be carried out, the chip has consequential technology. The benefit of a patent for the chip is obvious: the chip patent still hinders a rival who may succeed in getting around the pump patent.

Besides such questions regarding content, one must also check whether the business at all possesses what it believes to possess. If an invention has arisen from a cooperation, for example with a university or another business, this can mean more or less strong restrictions according

to the agreement between the parties. The same is valid if the business has given others licenses or is a licensee itself. Moreover, in young start-ups that lack an established intellectual property management process it is a common occurrence that the business simply neglects to claim the invention of an employee formally and correctly, or a patent is invalid because the business forgets to claim a necessary priority of an earlier patent application. While sometimes such mistakes can be made up for when recognized early, in many cases they entail that the business has once and for all failed to secure patent protection for the respective technology.

The results of the scope of protection analysis show which obstacles the patent portfolio puts in the way of possible imitators. This provides a solid basis for a justified estimate of the time competitors will require to overcome the obstacles and to bring a comparable product on the market. In addition, the analysis reveals how the portfolio may be enhanced to increase the new business's head start.

THE FREEDOM TO OPERATE ANALYSIS ASSESSES THE DANGER OF BEING BLOCKED BY RIVAL PATENTS

When Isaac Newton declared, "We make progress because we stand on the shoulders of the giants who went before us," he forgot something important: we also stand on the shoulders of crowds of little people who achieved smaller, but much more numerous contributions to progress. The consequence: Whenever we improve a basic idea or combine existing things to create something new, we build on the ideas of others and run the risk of violating their patents.

This danger is greater with some technologies than with others. It has been proven useful to distinguish between complex and discrete technologies. Complex technologies can only be utilized by employing others' patents. Discrete technologies, however, are normally independently usable.

Complex Technologies

Complex technologies generally are found where existing products are constantly being improved, made smaller or cheaper, and where products consist of many components that combine together. Such products prevail in some of today's most dynamic industries such as the electronic, semiconductor, telecommunication, and software industries. They are also well known in biotechnology and with medical appliances. Take, for example, the DNA-chip systems which are widely used in drug development and medical research to detect certain DNA sequences in a sample. A DNA-chip system includes a multiplicity of components which are protected by patents. The same applies to some steps of the procedures the system works on.

Whoever would like to bring such a product on the market must have access rights to all the technologies that are used in the product. Because it seldom occurs that one single business possesses all the necessary patents themselves, competitors are dependent on each other and forced to cooperate in order not to be blocked in turn. (For a thorough discussion of this so-called "complement problem," see Shapiro [2001].)

In some cases, businesses cooperate by bringing together their patented technologies to an official standard that is universally accessible for a royalty; standard setting organizations, like the International Organization for Standardization (ISO), the American National Standard Setting Institute (ANSI), and the German Institute for Norms (DIN), allow proprietary technologies to be included in a standard only if the patentee offers non-discriminatory and reasonable licensing conditions. That means that each competitor, even ones who have contributed nothing themselves to the pool of patents that makes up the standard, can get licenses after paying a fee. Thus even a newcomer can buy the right to use technologies included in the standard.

The most common form of cooperation, however, is cross-licensing, private agreements between businesses, in which these mutually license to each other complementary technologies. Commercially acceptable conditions can be best negotiated by the party that has a strong patent portfolio at its disposal. Here, the first mover advantage of the pioneers pays for itself. Moreover, the first party to build a patent portfolio in an emerging complex technical area has the chance to dominate the whole area over a long period of time. Stragglers, however, find themselves lost in a thicket of others' patent rights, which represent a considerable barrier to the area.

The success of such emerging businesses which want to bring products with complex technologies onto the market therefore depends decisively on how early they began to build up their portfolio and how aggressively they continue to develop it. A freedom to operate analysis provides this kind of information by comparing the development of the business's own portfolio with the developments of competitors' portfolios.

Discrete Technologies

The situation is different with discrete technologies. They predominate where new products are supported by a single specific technology, and where there exist only limited possibilities of incremental improvement. Such products are for example located within the area of consumer goods, with new materials, in the field of medical implants, and in other areas of medical technology. 3M's ubiquitous Post-it Notes are an everyday example of a discrete technology.

With such products, the danger of being hindered by competitors' patents is lower because their base invention is more independent than in complex technologies. This often has to do with the fact that advance in the relevant area frequently occurs in bigger, more distant steps, so that patents for the preceding technology have already expired.

On the other hand, because of the lack of a network of mutual dependency there is also less room for license negotiations with discrete technologies if a patent from another business should nonetheless need to be used. Therefore, a freedom to operate analysis with discrete technologies concentrates on tracing other, possibly hindering patents early on. For this, patent research is first carried out, which brings to light the patents related to the product relatively reliably. Next, a more exact evaluation of the claims of these patents shows whether a danger exists of being sued by one of the patentees. If this should be the case, the evaluation also shows which feature of the product could support such a lawsuit. With this information in hand one is in a position to judge the importance the feature in question has for the product, whether it is possible to do without the feature in order to avoid litigation, or whether the possibility exists of getting a license from the patentee.

Thus, according to the type of the technology, complex or discrete, the freedom to operate analysis uses different methods to arrive at an assessment of how big the danger is that the patent environment hinders access to the market. At the same time it shows which strategy the business should pursue in order to minimize this risk and take advantage of the opportunities the patent environment offers. A suitable strategy may involve aggressive patenting, taking licenses, or simply steering clear of competitor's proprietary technologies.

An emerging technology business that has a strong patent portfolio at its disposal and operates in a favorable patent environment has set the stage for a successful future. With patent due diligence, venture capital investors can check these success criteria and can thus identify a promising company more easily.

ENDNOTES

[1]See *European Patent Office Annual Report 2003*.

[2]The U.S. is a notable exception here. Since important inventions are, however, usually also registered outside the U.S., this restriction is bearable.

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