Akihiro Ryuka and **Stephen Hamon** of **Ryuka IP Law Firm** present a strategy for obtaining strong IP rights in electronics and software

Patent visualisation

In the electronics and software fields, the applications that result in the most valuable patents are typically the ones filed early, before the market for the protected products grows. Patent visualisation is an inventing strategy aimed at systematically developing ideas from a very early stage to optimise the chances of filing patent applications at the critical time before market growth. Central to patent visualisation are the processes of brainstorming, in which an early-stage idea is developed through a series of questions, and theme determination, in which a technical area of focus is selected and tested to determine its potential to yield early inventions with respect to market growth. Patent visualisation represents an opportunity for IP professionals to take on new roles and have a greater impact on the development of technology and the success of their companies.

This article is the first of a four-part paper. The other three parts will appear in the MIP Handbook (April), MIP Global Patent Review (June) and MIP Asia-Pacific IP Focus (September).

Filing date and value

The table below shows selected electronics and software patents for which a US District Court reached a verdict awarding damages to the patent holder of more than $150 million between 2005 and 2010. For each of these patents, the filing date of the patent application preceded the

Plaintiff	Defendant	Title of invention	Damages at District Court
Alcatel-Lucent	Microsoft	Perceptual coding of audio signals	$1,500,000,000
Uniloc USA	Microsoft et al	System for software registration	$388,000,000
Alcatel-Lucent	Microsoft	Touch screen form entry system	$368,043,056
i4i LP	Mircosoft	Method and system for manipulating the architecture and the content of a document separately from each other	$200,000,000
Cornell	Hewlett-Packard	Instruction issuing mechanism for processors with multiple functional units	$184,044,048
TGIP	AT&T	Telephone prepaid calling card system and method	

Akihiro Ryuka

In 1987, Akihiro Ryuka received a bachelor's of engineering from Tohoku University and his master's of engineering from Tokyo University. He became a Japanese Patent Attorney (*Benrishi*) in 1993. Akihiro's experience includes working for a firm in the US between 1995 and 1998, during which time he was admitted to practice before the US Patent and Trademark Office (limited recognition) in 1997. Since 2004, Akihiro has been admitted to stand before all Japanese courts in IP litigation.

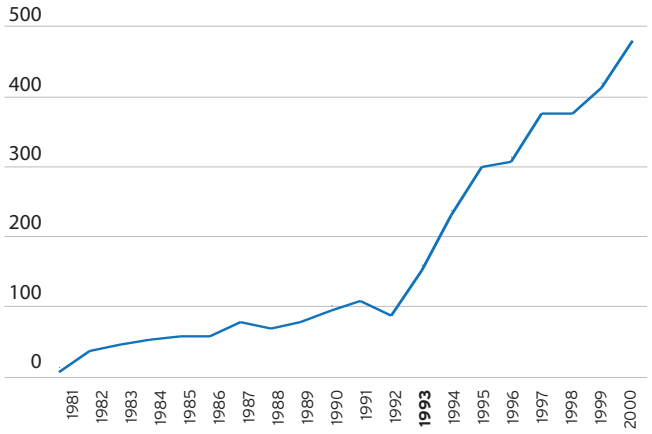
Since founding Ryuka IP Law Firm in 1998, Akihiro's practice has included patent prosecution specialising in computer software, data communication, radio communication, semiconductors and electronics, as well as design patents, trade marks, licensing, litigation and opinions. He is an active member of the Japan Patent Attorneys Association (JPAA) and the Japan Intellectual Property Association (JIPA).

Stephen Hamon

Stephen attended Stanford University as an undergraduate, where he received a bachelor's of arts and science with majors in physics and music. After graduating in 2004, he attended UCLA School of Law, where he received a Juris Doctor, and was admitted to the California Bar in 2007.

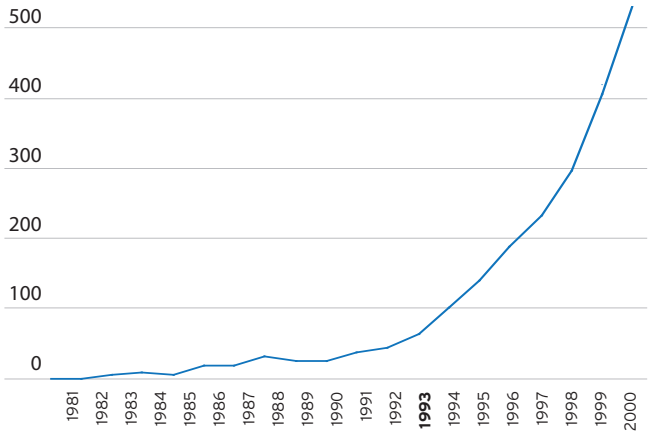
In 2008, Stephen joined Ryuka, and in 2010 he was admitted to practice before the US Patent and Trademark Office. He is engaged in the prosecution of US patent applications, including drafting amendments and remarks in response to US office actions. Stephen also drafts infringement and validity opinions and assists in conducting clearance searches.

Figure 1: Alcatel-Lucent's "Perceptual coding of audio signals" patent



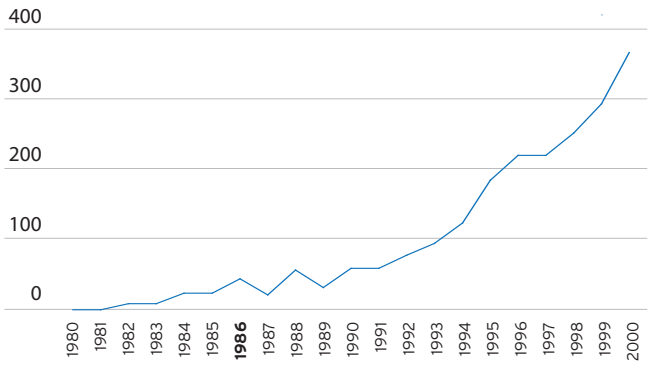
[Search Conditions] Claims: (audio OR sound) AND (code OR coding OR encode OR encoding) All text: noise OR error

Figure 2: Uniloc USA's "System of software registration" patent



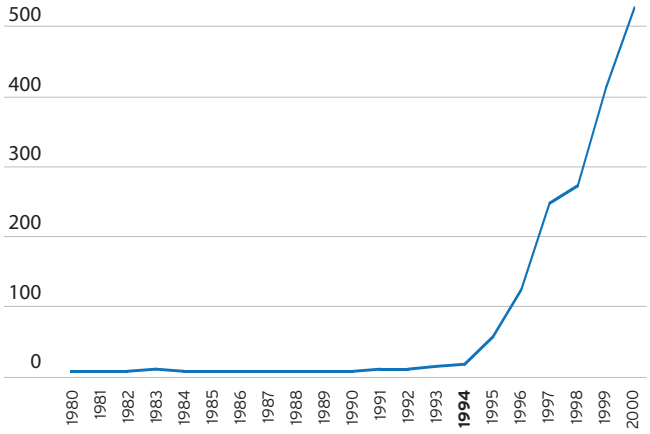
[Search Conditions] All text: (license OR licensing) AND (register OR registration) AND (software OR program)

Figure 3: Alcatel-Lucent's "Touch screen entry system" patent



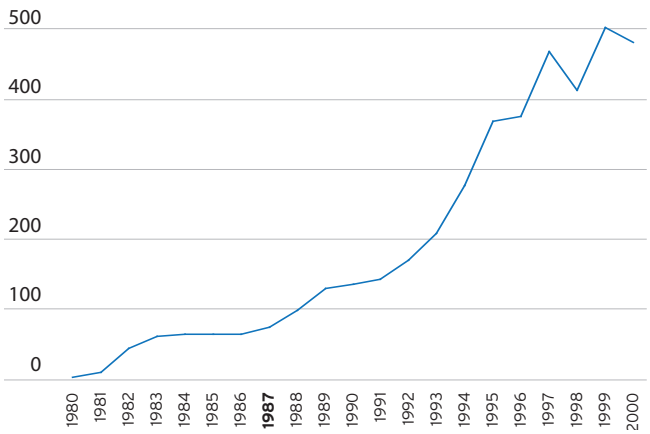
[Search Conditions] Claims: touch AND (panel OR screen OR display) All text: computer OR PC

Figure 4: i4i LP's "Method and system for manipulating the architecture and the content of a document separately from each other" patent



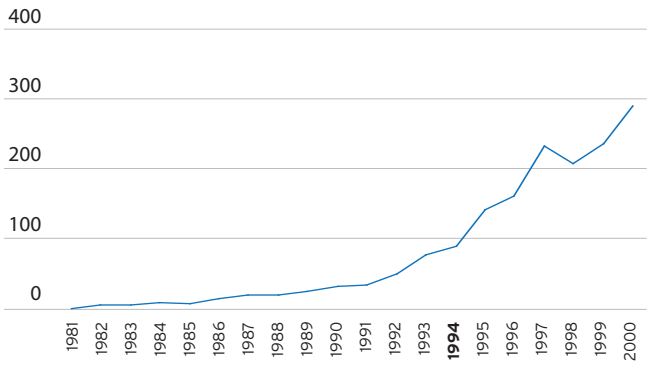
[Search Conditions] Claims: computer AND document. All text: metacode OR (meta AND language) OR HTML OR SGML OR markup

Figure 5: Cornell's "Instruction issuing mechanism for processors with multiple functional units" patent



[Search Conditions] Claims: (instruction OR command) AND (processor OR CPU) AND (parallel OR multi OR multiple OR concurrent)

Figure 6: TGIP's "Telephone pre-paid calling card system and method" patent



[Search Conditions] Claims: card AND (call OR telephone OR phone) All text: (security OR ID OR identification OR authorization) AND (number OR code)

growth in the number of related patent applications. Please note that the data in Table 1, which was retrieved from patstats.org on July 12 2010, represents only the initial damage award at the District Court level. Appeals are not considered.

Figure 1, above, illustrates the early filing date of Alcatel-Lucent's patent for "Perceptual coding of audio signals" (in bold, see Table 1). This patent attracted public attention when the District Court awarded Alcatel-Lucent $1.5 billion in infringement damages. In Figure 1, the line shows the number of applications related to the invention, as determined using the search conditions noted. Alcatel-Lucent's filing date (for the earliest patent involved in the infringement) was 1993. As shown in Figure 1, the Alcatel-Lucent patent was filed before the number of related applications started to rapidly grow.

Figure 2 provides another example, Uniloc USA's patent for a "System of software registration" (see Table 1). For this patent, Uniloc USA was awarded $388 million in damages by the District Court. Uniloc USA's patent was similarly filed, in 1993, before an accelerated growth in the number of related applications.

Figures 3 to 6 show the filing dates for the remaining patents listed in Table 1. For each of these patents, the application was filed at an early stage, before the number of related patent applications started to significantly rise.

So for many of the electronics and software patents that yielded high damage awards, the application was filed before the number of related applications started to increase. It seems, then, that in the electronics and software fields, to obtain a highly valuable patent, the application should be filed early. A few years ago, similar data based on Japanese court cases was studied, and the same conclusions were reached.

In addition to those in electronics and software, patents for inventions characterised by their shapes and mechanical structures were also studied. In this area, however, the same relationship did not exist between a patent's value and its filing date relative to an increase in the number of related patent applications. This is possibly because, in such areas, crucial technical problems are often discovered only after products are manufactured, so highly valuable inventions are created at this point. In electronics and software, on the other hand, many problems can be identified before any product development has taken place.

Engineers simply review the products they are developing and choose a possible invention to propose from among those products

Only short-term inventions are proposed

When the market for a particular device takes off, there is an increased demand for related products, which in turn calls for more developers. The developers are assigned the task of proposing inventions, contributing to an increase in the number of patent applications in the field. For this reason, the rise in the number of patent applications in a field is a good indicator of growth in the market for protected products. Many inventions that are proposed after the market has already grown are directed to technological improvements to

Figure 7: Knowledge management in patent visualisation

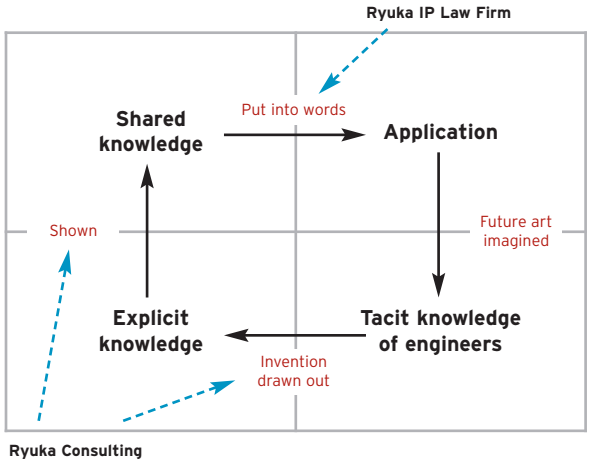
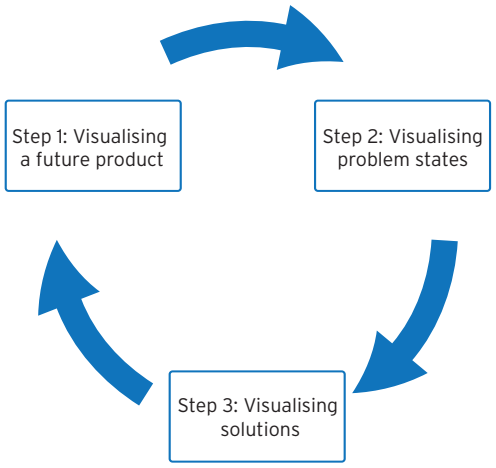


Figure 8: The brainstorming flow



be introduced into the market in the near future. Such technologies are usually not fundamental inventions capable of producing benefits in the relatively distant future. As such, these inventions can only be awarded narrow patent protection and rarely result in large benefits for the patent holder. In order to instead file patent applications before the number of developers in the field starts to increase, engineers should file applications not only for products already under development but also for early-stage ideas related to future technologies and products.

Unfortunately, the manner in which patent applications are typically prepared for filing is not conducive to this goal. Many companies assign invention quotas to their engineers, and require them to propose only completed or nearly completed inventions. Under such conditions, rather than considering future technologies and products, engineers simply review the products they are developing and choose a possible invention to propose from among those products. Even laboratory research aims at completing existing technologies and is rarely directed to investigating the potential problems that might arise in using future products.

The conventional process of preparing a patent application has another drawback. In order to obtain a strong patent, it is vital to discuss ways in which the patent might be circumvented or designed around before filing. To this end, second and third best versions of an invention should be considered, but such technologies are not attractive to engineers and are usually not fully explained in invention proposals. Since patent applications are often filed without sufficient discussion or consideration of variations, many patents are easily circumvented.

Salvaging one-line inventions

In addition to having ideas about products under development, which they typically propose as inventions, engineers are full of ideas about future products, potential problems associated with these imagined products, and the technologies that could serve as possible solutions. Many of these ideas may be so undeveloped that they exist as only a single sentence in the engineer's mind. In organic electroluminescent displays, for example, such an inventive idea might be "superimposing data communication information onto displayed images by controlling electroluminescent elements to flicker at an extremely high rate," "superimposing different information on an area-by-area basis," or "providing each display with a page memory so that different advertisements can be delivered to multiple displays on a train." Each of these concepts can be expressed in one line. An undeveloped idea that can be explained in a single line is often very likely to grow into attractive and highly valuable patent rights. Such one-line ideas, however, are too short to constitute invention proposals. To draw up proposals, engineers must put in more effort by thinking about details such as electrical circuit design, controller functions, and possible applications.

Engineers are well-equipped and motivated to turn products under development into invention proposals by considering the details. Such efforts contribute to their development projects. Engineers have difficulty, however, when it comes to seriously discussing ideas about future technologies and unfamiliar products, for the following reasons. First, they cannot easily decide whether their own ideas are novel or non-obvious because they have insufficient knowledge of recent developments in fields outside the field of the products they are developing. And second, they cannot be sure how much interest the company will have in commercialising such future technologies and products. Hence, engineers do not know whether their companies will want to file applications for these ideas and do not know whether they are worth an invention proposal.

Therefore, it seems a company cannot hope to file patents for all of its engineers' ideas simply by waiting around for invention proposals. To obtain highly valuable patents, a proactive process is needed. When engineers are encouraged to suggest ideas about technologies and products for which development has not yet started, it becomes possible to file applications for the fundamental patents of the future. For the past 12 years, our office has been actively pursuing one-line inventions, exploring possible variations of these inventions, and filing applications for them. We call this process patent visualisation since, by using the techniques discussed below, we can visualise future technologies before filing an application.

Knowledge management in patent visualisation

As a theoretical overview, Figure 7 illustrates the flow of knowledge in patent visualisation. Tacit knowledge represents what is known to the client's engineers but cannot easily be put into words. In principle, the engineers' tacit knowledge includes many valuable and patentable ideas and it is the job of patent visualisation to make these ideas usable for

the client. The patent visualisation process begins with deciding on technical areas in which inventions are to be developed by consulting with the IP and project departments of the client company (theme determination, discussed in parts 3 and 4 of this paper). At this stage, research is done into prior patent applications in the chosen technical areas in order to discover the issues and obstacles most commonly dealt with, the features that have already been developed or are under development, and the existing implementations and products.

After such preparation, brainstorming sessions are held in which many engineers participate (brainstorming is discussed in more detail in parts 2 and 3). During these brainstorming sessions, future products, technical obstacles, and potential solutions are drawn out of the minds of the engineers, often beginning as mere one-line inventions. This represents a transformation of tacit knowledge into explicit knowledge, as shown in Figure 7. The information gathered from the engineers is then illustrated in drawings and organised in order to be shared among all the participants. Thus, explicit knowledge becomes shared knowledge. At this point, questions are asked in an effort to explore variations and pin down concrete configurations of the inventions. The finalised ideas born from the brainstorming sessions are described in a patent specification and a patent application is filed. Specifications drafted in this way are for future products, including the specific configurations, uses, and technical problems related to these future products. These specifications help the engineers build new tacit knowledge for further inventions, thereby completing the flow of knowledge. Figure 7 also illustrates the typical role that our office plays in this cycle.

This process helps companies to strategically obtain highly valuable patents. The number of early-stage, pre-market growth inventions that can be created by patent visualisation may vary depending on preparation, experience of the participants, the themes of invention considered, and many other factors, but in very successful cases, a four hour brainstorming session has revealed as many as 20 early-stage inventions that were worth pursuing. (For further information on the concepts of knowledge management, including tacit knowledge, explicit knowledge, and shared knowledge, see *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*, by Ikujiro Nonaka and Hirotaka Takeuchi, from which patent visualisation borrows the above terminology.)

The brainstorming flow

Brainstorming sessions give the engineers a chance to introduce and receive feedback on their own ideas, such as the one-line inventions discussed above. As one might imagine, debate can escalate and discussion can get off topic, which can be time-consuming and reduce the efficiency of the process. Therefore, it is important to create a brainstorming flow that allows the engineers to come up with and present new ideas while keeping the discussion focused on relevant issues.

The brainstorming flow used in patent visualisation consists of the following three steps, as shown in Figure 8.

In step 1, a future product is visualised for the selected theme of invention, which, as mentioned above, is the technical area chosen based on preliminary research. (How the theme is chosen is discussed in parts 3 and 4, on theme determination.) In step 2, possible problems associated with the future product are considered and the state or condition resulting from each problem is visualised. In step 3, solutions to the problems are visualised. This process yields one or more new future products which then undergo the same three brainstorming steps. The process can be repeated many times.

Engineers cannot easily decide whether their own ideas are novel or non-obvious because they have insufficient knowledge of recent developments in other fields

A brainstorming example: The domestic solar cell

To illustrate the brainstorming flow, consider the case of the domestic solar cell. A house with domestic solar cells generates its own power. However, since the power consumed in a home fluctuates greatly, there are times when insufficient power is generated and power must be purchased from a power company. Likewise, there are times when excess power is generated and unused power is sold to the power company. Even if the average power generated per hour is sufficient to cover the overall power consumption of the home, power must constantly be bought and sold due to the fluctuation of consumed power. As a result, efficiency is lost.

Using the brainstorming flow shown in Figure 8, the domestic solar cell is visualised or imagined (step 1). While visualising this future product, the engineers are asked, "when is there insufficient power?" Answers from the engineers might include, "when clouds block the sunlight" or "when several appliances are running at the same time." Each of these situations is visualised as a problem state (step 2). The problem states can be visualised more specifically by, for example, considering the fact that a typical air conditioner turns on and off according to its temperature setting, resulting in fluctuating power consumption. Thus, there might be a lack of power when the air conditioner runs while the sun is hidden behind clouds. On the other hand, there might be excess power when the air conditioner is inactive while the sunlight reaches the solar cells. Having visualised these problem states, the engineers are asked, "what can be done to solve these problems?" (step 3).

In an actual case similar to this, an engineer answered this question with a one-line invention: "Let's make the air-conditioner run as much as possible while the sunlight is unobstructed." This suggestion was greeted with, "great idea! Now how can we implement this?" to which the engineer responded, "we can set the reference temperature of the air conditioner to be slightly different depending on whether there is excess power or insufficient power." Starting from this proposed solution, we were able to repeat the flow from step 1 to step 3 to further develop the invention. As one can imagine, the productivity of a session largely depends on what questions are asked and what suggestions are made. In the next part, available in the MIP Handbook, we will introduce ways of encouraging the brainstorm participants to think in the most productive ways.