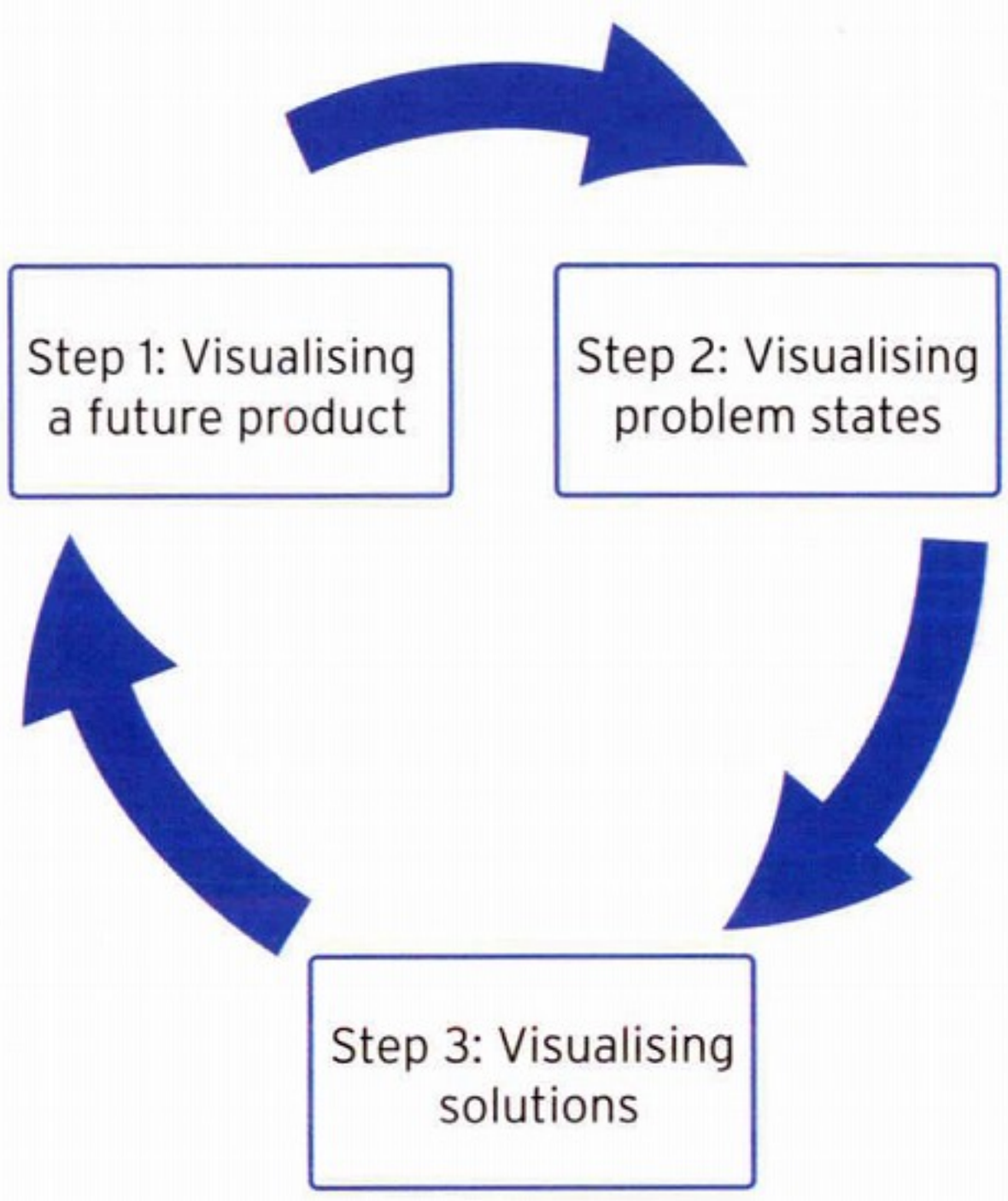
Patent Visualisation: part two

Akihiro Ryuka and Stephen Hamon of Ryuka IP Law Firm present the second part of a series of articles on their strategy for obtaining strong IP rights in electronics and software

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.

Figure 1: The brainstorming flow



Asking the right questions

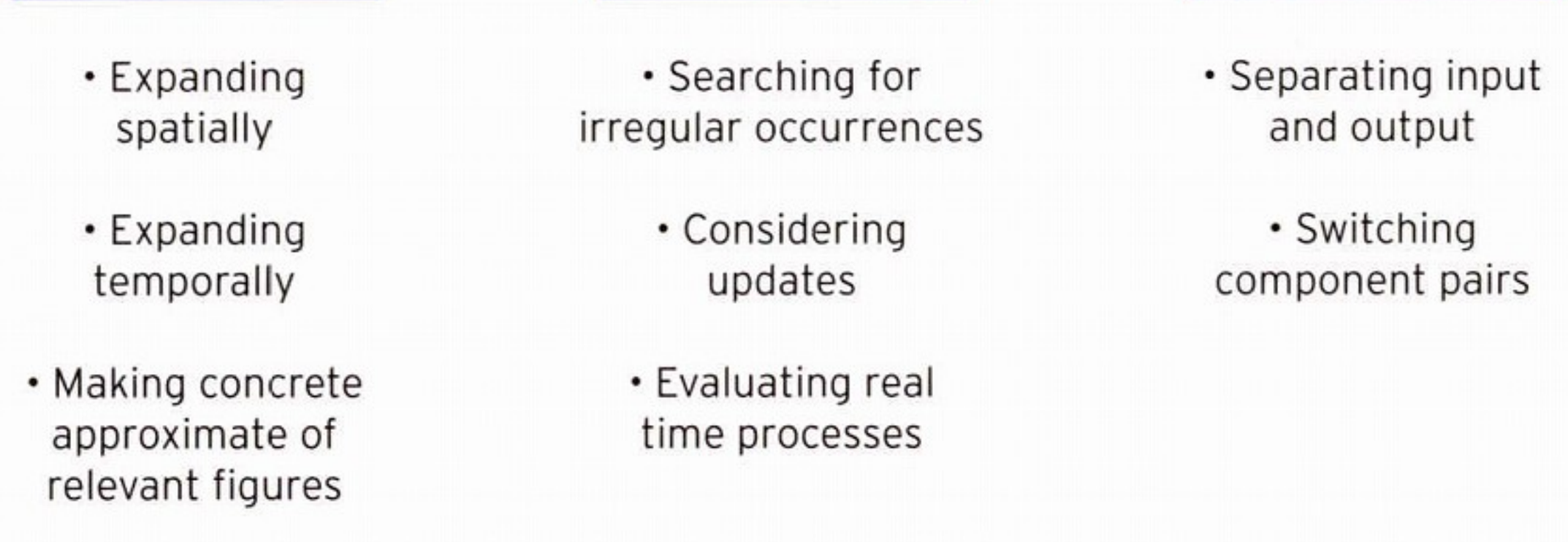
In part one of this paper, a brainstorming flow was described and illustrated (reproduced below as Figure 1). To demonstrate the brainstorming flow, an example brainstorming session was introduced on the topic of a domestic solar cell. As can be understood from the example of the domestic solar cell, optimising the efficiency of the brainstorming flow requires effective questioning of the engineers at each step. For example, the engineers were not asked to visualise solutions (step 3) until the details of an air conditioner's operation were considered. If step 3 had been started too early, before step 2 had been considered in enough detail, less useful solutions might have been proposed in step 3. An experienced questioner is able to judge the point at which the discussion should become more specific. In the case of the domestic solar cell, for example, the questioner might ask the engineers to clarify what types of appliances are typically used throughout the house.

Understanding what types of thought processes are most useful at each step of the brainstorming flow helps the questioner choose effective questions. During each step, the questioner should actively try to make the engineers engage in specific thought processes such as those categorised in Figure 2.

Visualising a future product

In the actual case of the domestic solar cell, the questioner prompted the brainstorm

Figure 2: Thought processes for effective brainstorming



participants to visualise the environment around the invention, including the power requirements of common household appliances. We refer to this type of thinking as expanding spatially (see Figure 2).

As another example of expanding spatially, consider an electric car. An electric car might use various charging stations, such as at the owner's home or the supermarket. While charging at any of these stations, it is possible for the electric car to be aware of its own location using, for example, GPS. Since a typical car regularly travels to the same few places, it is also possible for a car battery to know in advance how much power is necessary for certain trips. If different charging stations have different costs (for example the owner's home might be less expensive than the supermarket), information about location and power requirements would make it possible for the car battery to charge in a more cost efficient manner, for example, by not overcharging at the supermarket. By spatially expanding the scope of consideration to include places the electric car typically travels, a more efficient method of charging a car battery can be invented. Expanding spatially is a useful thought process for almost any invention, and is especially important when the invention under discussion plays an auxiliary role in a larger apparatus.

The related thought process of expanding temporally involves looking beyond the time periods that seem most immediately relevant when visualising the future product. Continuing with the example of the electric car, when visualising the electric car charging late at night after returning home, the engineers can be prompted to further visualise the time period before the discounted night time power period and the time period after the automobile has finished charging. This may lead to inventions relating to the activity of the electric car during these two time periods.

The third example thought process listed in Figure 2 under step 1 is making concrete approximations of relevant figures. This thought process involves estimating a range of values for transmission speed, memory capacity, processing time, or any other figure relevant to the future product being visualised and displaying these numbers on-screen in a diagram. As an example, consider a brainstorming session about traffic cameras used to identify vehicles at traffic lights or toll

booths. Although traffic camera systems typically do not use very high resolution cameras, the brainstorm participants are aware that current digital cameras can capture, for example, 10 megapixel pictures. Knowing this, simple calculations can be made over the entire possible range of resolution, which leads to visualising a traffic camera system that does use high resolution digital cameras. Taking into account the required capture rate as well as the number of cameras in the system, one can approximate the memory required to store images when such high resolution cameras are used. Consideration of the resulting problem that not enough memory is available may lead the inventors to think of ways to cut back on the memory required by the system. Since, in a traffic camera system, high quality images are more necessary for images of license plates than for surrounding images of other parts of the car, an invention involving only capturing license plates in high resolution is thus created. Making concrete approximations in this way is most useful toward the end of step 1 as a means of improving the effectiveness of the next step, visualising problem states.

Visualising problem states

Engineers can focus on unexpected problems by using a thought process we call searching for irregular occurrences. For example, the idea of having a fax machine print out transmission error reports may have resulted from considering the irregular cases where a fax cannot be sent. Engaging in this type of thinking during brainstorming is particularly useful when the discussion relates to software that targets a large number of general users, because in such cases the most irregular occurrences will inevitably occur.

Another thought process useful when visualising problem states is considering updates. Rather than, or in addition to, focusing on irregular occurrences, considering updates involves looking for those regular situations that would nevertheless require a system update or reconfiguration. For example, a display device with a light emitting element that gradually emits less and less light may require reconfiguration of the screen contrast and the reference current applied to the light emitting element. Thinking about these aspects of a future product is useful when the brainstorming session relates to devices with parts that have decaying efficiency.

A third example, evaluating real-time processes, involves finding those processes for which real time execution is most essential. Once found, the brainstorm participants consider whether such processes would remain problem-free under extreme conditions, such as if the amount of data or the number of process repetitions were to be increased 100-fold. If such a consideration reveals a problem, the engineers should determine whether there are any processes being executed in real time that might instead be wholly or partially performed in advance, when there are more available system resources. This type of thinking is particularly important in fields where the amount of data or the number of process repetitions is expected to increase exponentially in the future.

Visualising solutions

When visualising solutions, it is often useful to separately consider the criteria used by a future product to formulate a judgment and the actions to be taken based on that judgment. We call this thought process separating input and output. For example, when considering the basis for judging whether the light emitting element from the above example has decayed, possible indicators and considerations include the brightness after decay, the number of years that have passed, the overall time spent emitting light, the average amount of light emitted in the past, and any initial variation between the pixels. The question of what action to take after the light emitting element

is judged to have decayed also has a variety of answers. After separately considering the potential bases on which an apparatus makes its judgments (the input of the apparatus) and the potential processes performed by the apparatus (the output of the apparatus), a broad patent application can be filed that covers all of the possible combinations.

Another thought process useful when visualising solutions is one that we call switching component pairs. For example, the brainstorm participants might be asked to imagine exchanging a sending function with a receiving function or vice versa. Consider an apparatus that measures or calculates distortion in a signal caused by a transmission line and uses a receiver to compensate for the distortion of the received signal. It might be possible to design a similar apparatus in which signal distortion is instead compensated for at the transmission side. Other examples of component pairs that can often be switched with one another include a light emitting element and an image capturing element, and a writing section and a reading section.

The above recommended thought processes are only examples. An experienced questioner should be familiar with many such thought processes, and should be able to judge their usefulness and applicability to a particular brainstorming session. By considering specific thought processes like the ones described above, the questioner is able to devise the most effective questions for each step of the brainstorming process and enhance the development of the invention.

Differences in experience

If the participants are not experienced in the brainstorming flow, the discussion often remains focused on solutions for potential problems at the expense of the other steps. However, without sufficient visualisation of the future product and problem states, only easily-predictable solutions will be proposed. This makes it difficult to arrive at a fundamental invention for which a wide range of rights can be claimed. If the participants are inexperienced, it is necessary for someone to guide the discussion through each of the steps of the brainstorming flow explicitly: to first visualise a new future product in a particular technical area (the chosen theme, discussed in later articles), to then visualise a problem state of this future product, and only finally to visualise solutions.

If, on the other hand, the participants are experienced with the process, they may be able to think through the three steps of brainstorming quickly and discuss new future products, problem states, and solutions in any order. Even so, with experienced participants, we have found it helpful for the patent visualisation leader to organise the ideas being discussed into future products, problem states, and solutions, and display them on-screen. This makes it easier to see if a certain line of discussion has been overlooked, allowing the participants to fill in missing pieces in the latter part of the brainstorming section.

Selecting the right direction

In the brainstorming process discussed above, the invention is developed by visualising how technology will be used in a future product (step 1, see Figure 1), what problems might arise from such usage (step 2), and what possible solutions to these problems exist (step 3). A brainstorming session that is organised in this way helps to maximise the inventive output of the participants, but without being broken down further the resulting discussions remain very open-ended. By using the prior art that is publicly available, a more specific direction of development can be selected to further focus the brainstorming efforts of the participants.

Investigating the prior art is especially important considering the fact that the engineers are being asked to visualise future

Figure 3: Patent map for an air conditioning unit

Technical element \ Problem/goal	Warming the area around a person	Warming the house before a person returns	Power efficency
Compressor	• Increased operation when a person is far	• Remote control • Timer	• Gradually decreasing the set temperature
Wind direction, wind strength	• Directing the wind toward a person	–	• Circulating the air near the ceiling
Sensor	• Measuring the temperature of the area around a person	• Measuring the temperature outside	• Detecting that a room is empty and reducing operating strength

products and technology that might be very different from what they are now developing. Unfortunately, a lot of time would be needed to completely understand all of the related prior art, since at this stage only a broad technical area or theme has been selected. An extensive search would delay the development of what could be a critical invention. Therefore, investigation of the prior art must be limited in some way.

The drawbacks of patent maps

One way that investigation of the prior art is traditionally conducted is with the aim of creating a patent map. A patent map is a chart with, for example, different components, types, and possible uses of a product as rows, and with various problems and objectives as columns, where a given box in the chart might be a particular problem or objective associated with one use of the product. Based on a prior art investigation, each box in the chart is filled with a brief description of a technology that addresses the particular problem or objective. After creating such a chart, the engineers can see which boxes are lacking in technology, and can focus their inventive efforts on fulfilling these needs.

Figure 3 shows an example of a patent map for an indoor air conditioner. (A three-by-three chart is shown by way of example, but an actual chart is much larger.) Note that technology concerning how to control wind direction and wind strength to achieve the objective of warming the room before returning home has not been considered. A patent map does have its uses, particularly when trying to find potential inventions that have been overlooked.

The most valuable patents, however, come from somewhere not shown in this chart. For example, a fundamental patent might be created:

- when a new technical element is created;
- when a new use of technology is discovered; or
- when a basic problem is found in a new application of technology.

It is difficult to come up with these types of inventions by using a patent map because they

represent new rows and columns, not cells. New rows and columns are only added to the patent map after many patents have already been filed for the new idea. In other words, the traditional method of creating a patent map cannot reveal the direction in which an invention should be developed to obtain a fundamental patent.

Assessing prior art development

Before brainstorming, instead of undertaking an exhaustive prior art search, and instead of using prior art to make a patent map, the patent visualisation participants should investigate the prior art for the purpose of ascertaining how deeply previous inventions have been explored, that is, the degree of development in the prior art.

A person who has spent three or four years filing patent applications in an IP department or a patent law firm has probably had at least one experience of seeing an invention proposal and immediately thinking "this invention is really obvious," or "this invention is too broad". Even without being aware of any specific prior art, a person might have a feeling that an invention cannot be patented. It is our belief that this intuition often comes from an unconscious comparison between the invention and the degree of development in the prior art, that is, how developed the field is.

For an experienced IP professional working in their own field of expertise, the degree of development in the prior art is known, resulting in the intuition described above. When it is not known, the degree of development in the prior art can be ascertained by evaluating how far the invention development process in the field has proceeded. If the prior art includes inventions relating to very limited ranges of use or inventions relating to unexpected problems, it can be said that the degree of development is high. In such cases, inventions relating to broader ranges of use and more common problems are already widely known. On the other hand, if the prior art consists entirely of inventions relating to very broad ranges of use and solutions to basic problems, it can be said that the degree of development is low.

Studying the degree of development in the prior art simply involves looking at the unexamined application publications from the last year or two before brainstorming. Since each unexamined application publication discloses a product or other use of some technology, a problem to be solved and a detailed solution, it is possible to understand how far the invention development process has progressed in the prior art. In the next part of this series of articles, which will be available in the Managing IP Global Patent Review, we will explain how the degree of development in the prior art can be used to select a direction in which to develop the invention during the brainstorming session.

This article is the second of a four-part series. The first part appeared in Managing IP magazine's Japan IP Focus (February) and the remaining two parts will appear in the Managing IP Global Patent Review (June) and the Managing IP Asia-Pacific IP Focus (September).

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