



A new approach for optimizing open innovation based on IP analysis in Japan

Abstract

Japanese companies are more actively trying to take advantage of the extensive patent portfolio which has been accumulated in Japan. The "visualization" of intellectual property by patent information analysis and the "verification of hypotheses" based on this can provide the key information for companies to evaluate intellectual property more accurately and accelerate direct exploitation of intellectual property by licensing, trading and the like. In this study, the specific applications of patent information analysis are illustrated in terms of three symbolic aspects for optimizing open innovation, thereby suggesting information useful for activating future domestic and cross-border trading of intellectual property in Japan.

1. Introduction

Apparently, Japanese companies have not fully exploited intellectual property such as patent for a long time. More specifically, for many companies, intellectual property such as patent has been merely intended for "secured practice of patented invention owned by the company within the company itself", and less exploited as more direct business resources such as licensing and patent trading.

However, recently, more companies, regardless of their sizes, from mega-corporations to start-ups, are increasingly trying to promote their business strategy by more directly utilizing intellectual property such as patent. As factors behind the trend, pointed out are, the stagnant domestic market due to the prolonged economic downturn, and the decreased cost-competitiveness of Japan as a major manufacture-oriented country due to emergence of other Asian nations such as China. Even in Japanese companies, therefore, the necessity for allowing third parties including those from overseas to practice the intellectual property held by the said Japanese companies, or for selling it as a package instead of practicing it, is becoming evident rapidly.



In this study, the up-to-date situations about how Japanese companies are trying to exploit intellectual property are specifically illustrated in terms of the following three aspects: (1) search of collaboration partners for open innovation, (2) exploitation of patent for business development and (3) creation of business synergy within the same enterprise group. At the same time, an attempt for optimizing open innovation by accurate patent information analysis is illustrated.

2. Search of collaboration partners for open innovation

One of the most important factors for promoting open innovation may be to identify the best collaboration partner. This is because, the acquisition, of resources which aren't present within the company, is one of the major objectives of open innovation, and the success or failure is greatly dependent on choosing the best partner for achieving its business strategy.

Patent information analysis can be one of the optimal approaches for satisfying the needs of searching the best collaboration partner as mentioned above. We will show specific examples for illustration.

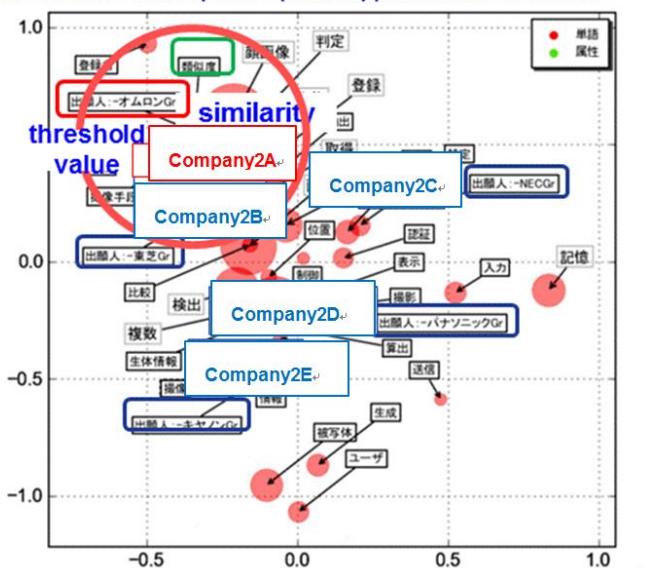
Below, selecting a collaborator which has a "facial recognition technology" is selected as a hypothetical business task Fig. 2-1 shows results from the characteristic word analysis in patent applications relating to the facial recognition technology which were filed in 2006.

Fig. 2-1



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Characteristic word space of patent applications filed in 2006



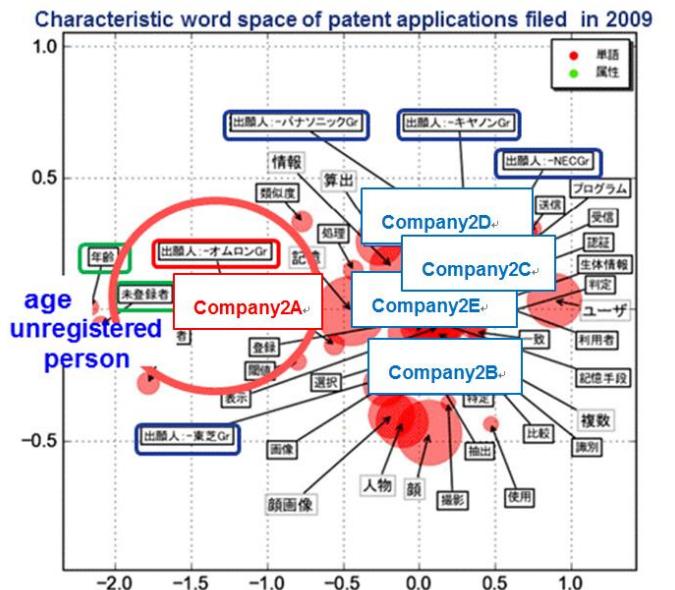
In Fig. 2-1, the size of a bubble corresponds to the magnitude of the frequency of each characteristic word in the characteristic word space retrieved from patent applications relating to the "facial recognition technology." Further, the degree of association is shown by relative distance based on the co-occurrence of the characteristic words. Moreover, the frequency of a characteristic word for each applicant represents the position of that applicant. For example, the characteristic word space shows that Company 2A and Company 2B, one of the major Japanese electronics manufacturers, are located in relatively close positions, and also close to the characteristic words such as "similarity" and "threshold."

When a company tries to exploit intellectual property, the "visualization" of intellectual property as described above by patent information analysis is extremely important. This allows executive officers, who are not directly involved in intellectual property and usually do not read patent specifications, such as those who are responsible of business strategy, marketing, finance, legal affairs and the like, to discuss and evaluate intellectual property under the same background without reading any specifications and to share suggested information, which can, in turn, deepen internal discussion to promote a faster and better management decision.



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Fig. 2-2



Next, Fig. 2-2 shows results from the characteristic word analysis of patent applications filed in 2009 relating to the facial recognition technology. It is clearly evident that, when comparing Fig. 2-1 and Fig. 2-2, in 2009, Company 2B has moved away from Company 2A and moved to a position closer to other companies, i.e., Company 2C - Company 2E, while Company 2A becomes a player who is distant from other companies. Further, it is evident that, Company 2A is located very close to the characteristic words such as "age" and "non-registrant" which are seemingly not relevant to the facial recognition technology.

The analysis described above reveals that Company 2A takes a unique position which is very different from other companies with respect to "facial recognition technology," leading to a hypothesis that the company can be a unique collaboration partner having characteristics such as "age" and "non-registrant."

Fig. 2-3



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Fig. 2-3 shows a specific example of the "facial recognition technology" found when the non-patent information of Company 2A was investigated on the Internet based on the above hypothesis. It does not fall into a category of a security technology applicable to a gate system and a personal authentication system which many companies are developing, but is a technology which the company has developed and commercialized, for example, as a technology applicable to a marketing system for estimating the age, sex, smile of a customer (not-registered) and for estimating whether the customer (non-registered) is a baby, who comes into a store.

As demonstrated above, the patent information analysis has a capability to reveal the position of each company in a technical field of interest in terms of characteristic words to identify a unique collaborator for open innovation.

Please note that in this case, a specific product from Company 2A was able to be identified by analyzing non-patent information. However, even if such a product were not identified, an attempt for predicting commercialization of such a product and service in the near future based on the characteristic words of Company 2A such as "age" and "non-registrant," may be a useful activity for selecting a collaborator for open innovation.

3. Exploitation of patent for business development

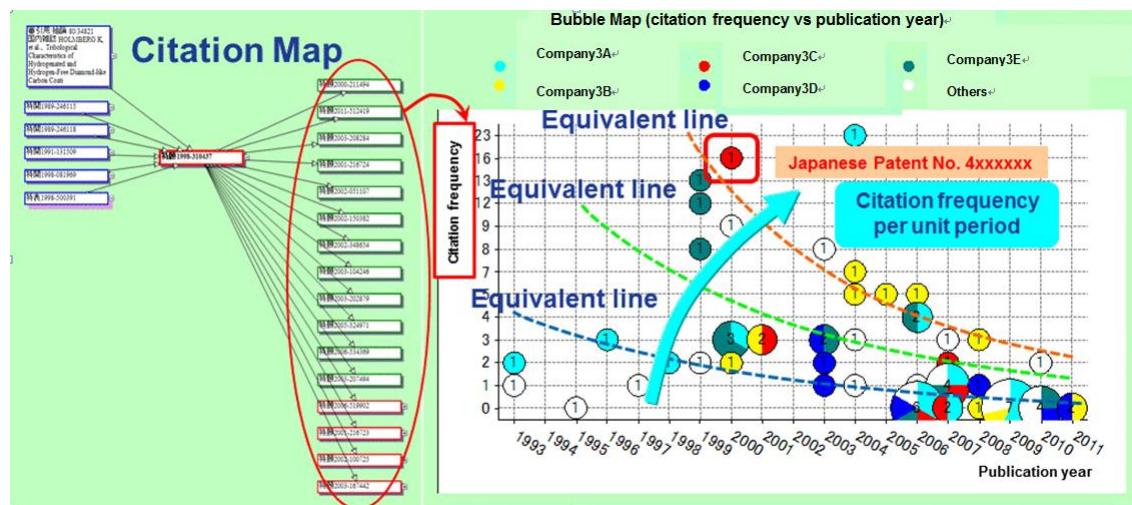
Next, an example of exploitation of patent for business development is described. Fig. 3-1 shows an example of the traditional patent citation analysis. In this case, what type of business development Company 3C,



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Japanese major piston-ring manufacturer, should pursue together with affiliated companies is discussed based on its own patents.

Fig. 3-1



The traditional patent citation analysis is based on the hypothesis that a patent having more forward citations (being cited) is more valuable. In Fig. 3-1, however, some modification is made depending on the length of a publication period. That is, based on a view that the longer the publication period is, the chance of forward citations (being cited) will increase, and the traditional hypothesis is modified such that the more forward citations (being cited) it has, "per unit period," the more valuable it is. Fig. 3-1 shows the modification as equivalent lines. In the figure, Japanese Patent No. 4XXXXXXX relating to a DLC thin film, which is found on the most valuable red equivalent line, among the patents of Company 3C, is identified as the key patent for business development of the company.

Fig. 3-2



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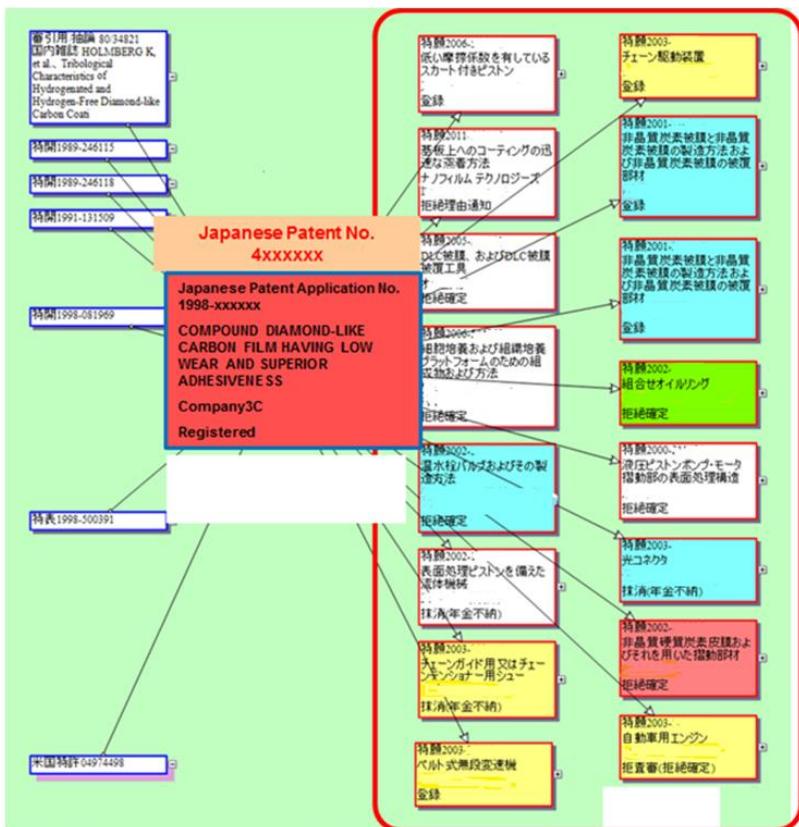


Fig. 3-2 shows the relationship of the forward citations (being cited) of Japanese Patent No. 4XXXXXX of Company 3C. Specifically, this patent has been cited in the examinations of 16 subsequent patent applications in total, including citations by Company 3C, as shown in Fig. 3-2. The characteristic word analysis is done on these 16 patent applications in order to identify a direction in which Company 3C may pursue its business development.

Fig. 3-3



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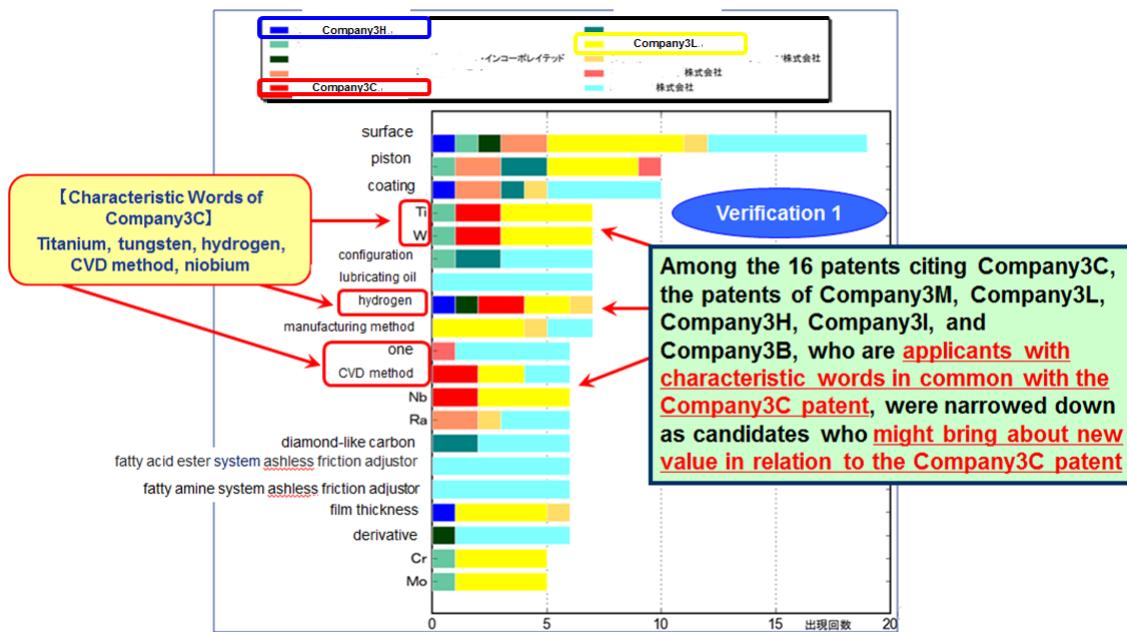


Fig. 3-3 shows results from the characteristic word analysis of the target patent of Company 3C and the 16 patent applications in which the patent is cited. As shown in Fig. 3-3, the analysis reveals that the words "titanium" and "tungsten" among the characteristic words showing relatively high frequency are similarly found at high frequency in the patent applications of Company 3M, Japanese major automotive company, and Company 3L, Japanese major electronics manufacturer, in addition to Company 3C. The analysis also reveals that the word "hydrogen" is similarly found at high frequency in patent applications of companies, such as Company 3H, Japanese cutting tool manufacturer, Company 3I, U.S. biomedical research institute, Company 3L and the like, in addition to Company 3C. As demonstrated above, a direction in which Company 3C may pursue its business development and the candidate collaborator for the development can be specifically suggested by specifically analyzing the relationship with many forward citations of patent applications (being cited).

Fig. 3-4



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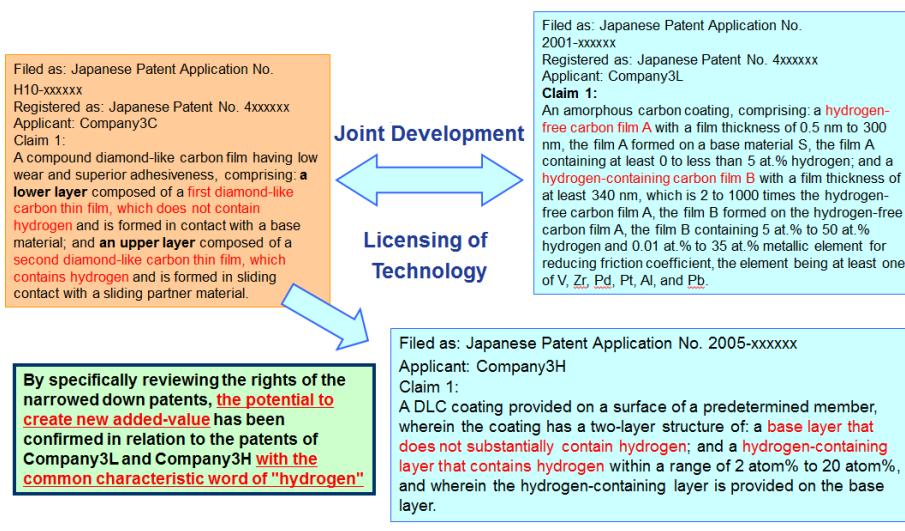


Fig. 3-4 shows a direction in which Company 3C may pursue its business development, identified based on the relationship with other companies having the common characteristic words among the 16 patent applications in which the patent of Company 3C is cited. First, a possibility of co-development with Company 3L is suggested because the patent application of Company 3L was once rejected during the examination by citing the patent of Company 3C, and then eventually patented after minor amendment. That is, Company 3C which possesses a patent right of a fundamental invention may be able to form a so-called "alliance of the strong" by collaborating with Company 3L which has a patent right of a successor invention located downstream in the flow of the technical development.

In contrast, a possibility of licensing out the patent right of Company 3C to Company 3H is suggested because the patent application of Company 3H has been conclusively rejected in the examination by citing the patent of Company 3C. That is, a practice of the subject matter according to the patent application by Company 3H may violate the patent right of Company 3C, and Company 3C may have an opportunity for licensing out the right to Company 3H.

As demonstrated above, the combination of the text analysis with the traditional citation analysis is capable of identifying combinations showing

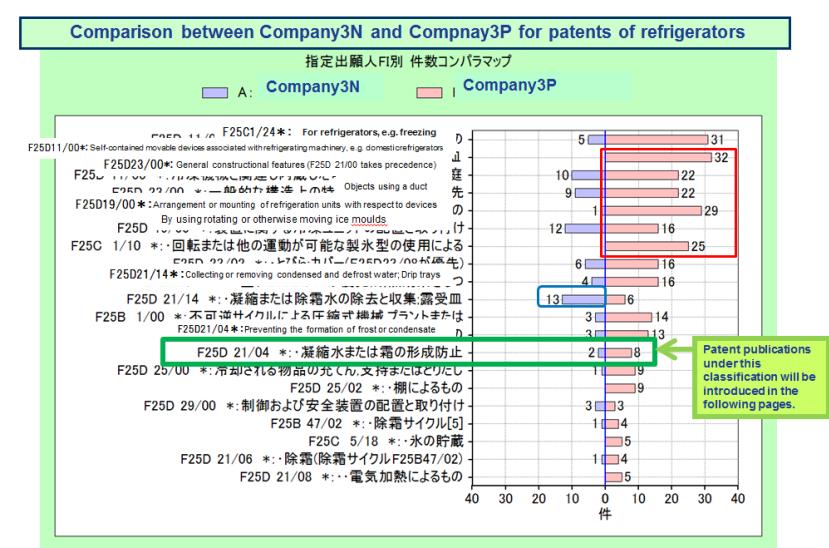


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more common terms among a large number of forward citations (being cited), and capable of even suggesting specific approaches and methods for business development.

Next, another example of exploitation of patent for business development is described. Fig. 3-5 shows a map in which the number of patents relating to refrigerators, is compared between Company 3N, Japanese major electronics manufacturer, and Company 3P, Chinese major electronics manufacturer, for each technical filed. Please note that in Fig. 3-5, technical fields used for comparing the number of patents are identified using FIs (File Index) which are assigned and maintained by Japan Patent Office as a subclass of IPC. As described above, the original technology classification terms of Japan Patent Office, which can provide more detailed classification than IPC, has superior characteristics than the patent information analysis in other countries, and information can be analyzed in more detail when comparison is performed in combination with the F-term.

Fig. 3-5



As shown in Fig. 3-5, although Company 3P is dominant in terms of the total number of patents, Company 3N may still hold an advantage in a technical filed of defroster pans. For Company 3P, the above technology of Company



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3N can be a target for licensing-in or acquisition. In this example, we take the position representing Company 3P, and attempt to conduct business development for acquiring the technology while having a win-win relationship with Company 3N. To this end, the patents relating to a frost prevention technology, in which Company 3P has an advantage in terms of the number of patents, are investigated.

Fig. 3-6 represents the description of a patent relating to a frost prevention technology among the patents of the Company 3N shown in Fig. 3-5.

Fig. 3-6

Weakness candidate of Company3N: Patent directed to heater control for preventing condensation

Proprietor	Company3N
Title of the Invention	Cooling Storage Shed
Application No.	2002-xxxxxx
Registration No.	4xxxxxx
[PROBLEM TO BE SOLVED] To further inexpensively cope with heating quantity control of a heating means for preventing dew condensation.	
[SOLUTION] An outside air temperature sensor is installed on a refrigerant pipe in the outlet vicinity of a condenser in a refrigerating plant, and commonly uses an originally arranged sensor for detecting failure of the refrigerating plant. Since a flow of a refrigerant is hardly caused when stopping the refrigerating plant such as before starting the refrigerating plant or until the refrigerating plant is driven again (in the timing A) after finishing defrosting operation, a temperature of the refrigerant pipe in the outlet vicinity of the condenser becomes equal to an outside air temperature. Thus, a detecting temperature of the outside air temperature sensor at refrigerating plant stopping time is taken in a control means as the outside air temperature, and a power supply rate to a dew condensation preventive heater is controlled according to a difference between this outside air temperature, and a shed inside temperature, and a surface temperature of the port edge of an inlet-outlet is maintained at a temperature causing no dew condensation. The dew condensation can be surely prevented while restraining waste of electric power, and an existing temperature sensor is used in common as the outside air temperature sensor to inexpensively cope with the control.	

As shown in Fig. 3-6, for Company 3P, this patent, which is a fundamental invention and, has a wider scope of rights, is a promising target for licensing-in or acquisition.

Fig. 3-7 shows a patent relating to a frost prevention technology among the



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patents of Company 3P shown in Fig. 3-5 which can be a potential counter proposal to Company 3N.

Fig. 3-7

Strength of Company3P: Patent directed to controlling a condensation preventing heater

Assignee Company3P

Application No. 2005-xxxxxx

Registration No. 4xxxxxx

[PROBLEM TO BE SOLVED] To solve a problem on a refrigerator using CO₂ as a refrigerant that a high temperature pipe for the refrigerant in a freezing circuit arranged near the opening edge of the refrigerator cannot be used as a dew condensation preventing pipe.

[SOLUTION] The cooling storage box comprises a body formed of a heat insulating box opened at one face; a heat insulating door provided on one face side; a machine room formed in the body; a compressor arranged in the machine room to form part of a freezing circuit; a dew condensation preventing refrigerant pipe forming part of a condenser which condenses a refrigerant discharged from the compressor, and arranged at the opening edge on one face of the heat insulating box; and an evaporation accelerating refrigerant pipe forming part of the condenser which condenses the refrigerant discharged from the compressor, and arranged in an evaporating tray, wherein the refrigerant in the freezing circuit is CO₂, and wherein a **dew condensation preventing electric heater** is provided in parallel to the dew condensation preventing refrigerant pipe **with a duty factor set higher for a predetermined period from finishing defrosting.**

The patent shown in Fig. 3-7 has a high degree of perfection as a frost prevention technology, suggesting that Company 3N may find it attractive for employment in its own refrigerators. Further, during the examination of the above patent of Company 3P, the above patent of Company 3N shown in Fig. 3-6 was cited.

Considering the above relationship, the following proposal from Company 3P, is conceivable: Company 3P offers the above patent relating to a frost prevention technology having a high degree of perfection and seemingly attractive to Company 3N, while suggesting that Company 3N provides the above patent relating to defroster pans which is a potentially valuable target



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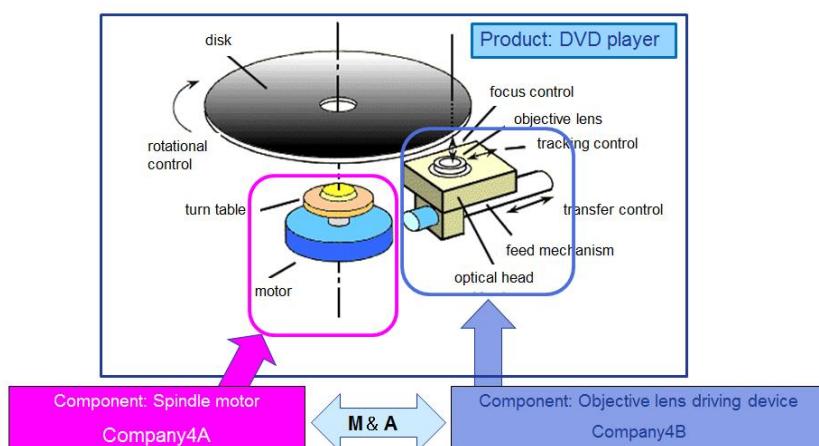
for licensing-in or acquisition for Company 3P.

As demonstrated above, in business development, patent information analysis can identify an attractive technology for a counterpart which is a potential target for licensing-in or acquisition, and allow formulation of a specific and effective approaching strategy.

4. Creation of business synergy within the same enterprise group

Finally, an example of creation of business synergy within the same enterprise group based on the patent information analysis is shown. Fig. 4-1 shows the relationship between technology domains of Company 4A, Japanese major electronics manufacturer, and Company 4B, subsidiary of the Company 4A, within the Company 4A Group.

Fig. 4-1



As shown in Fig. 4-1, Company 4A has a technology domain in spindle motor bodies of DVD players, and Company 4B has a technology domain in objective lens driving devices. In this case, we attempt to create technological synergy between the two companies merged into the same enterprise group by M&A.

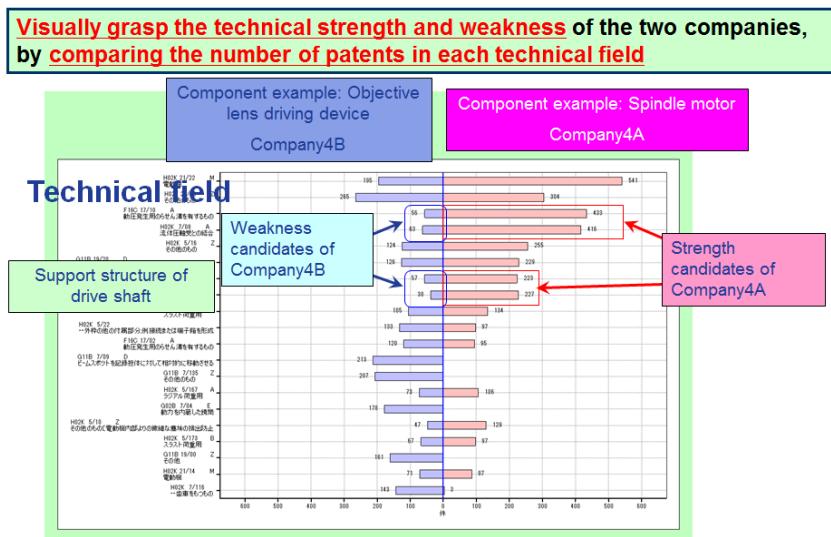
Fig. 4-2 shows a map which compares the number of patents, for each



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technical field of the two companies.

Fig. 4-2



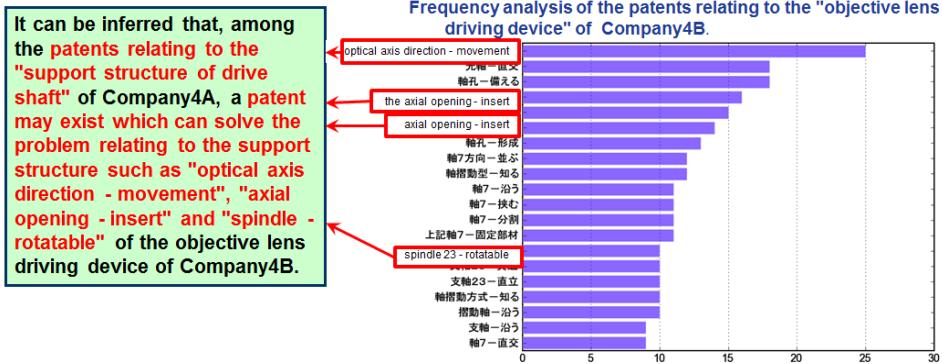
As shown in Fig. 4-2, Company 4B may have a relative technical weakness in support structures of drive shafts compared with Company 4A. In this case, we examine a possibility that the above technical weakness is overcome by the technology of Company 4A in this technical field.

Fig. 4-3 shows results of analyzing characteristic words found in the section "Problem to be Solved" of patents relating to objective lens driving devices among the patent publications of Company 4B.

Fig. 4-3



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As shown in Fig. 4-3, in the patent publications of Company 4B, characteristic words which seem to be related with support structures of drive shafts such as "optical axis direction - movement," "axial opening - insert" and "spindle - rotatable" are found in the section "Problem to be Solved" at high frequency.

Therefore, it is suggested that the technology relating to "support structures of drive shafts" which represents an advantage for Company 4A may be able to solve problems in objective lens driving devices which are in a technology domain of Company 4B.

As demonstrated above, an attempt for creating technological synergy between companies which have become a part of the same enterprise group by M&A may be able to be promoted based on the patent information analysis.

5. Conclusion

As demonstrated above, various suggestions can be obtained for business strategy by performing the "visualization" of extensive patent information with a patent map. A hypothesis based on this is formulated, and confirmed by closely examining non-patent information and identified patent publications. By repeating this cycle, we can actively exploit intellectual property for business activities. As shown in Fig. 5-1, through these processes, a company can identify an appropriate collaboration partner for



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open innovation to conduct various business developments and to create synergy within the same enterprise group.

Fig. 5-1

- ✓ **Visually grasp patent contents through various maps**
- ✓ **Formulate hypothesis based on suggestion by the maps**
- ✓ **Verify the hypothesis by reviewing non-patent documents and investigating technical scopes**



In particular, it is expected that active exploitation of extensive patent portfolios accumulated so far, including licensing and acquisition, will further increase, in Japanese companies. Therefore, in the future, the potential value of them showing significant economic effects will likely become evident. In the course of this process, the detailed technology classification terms (FI and F-term) assigned by Japan Patent Office and analysis with Japanese language may be the key to maximize the potential.