
Author: Zhang Wei

State Intellectual Property Office of People’ Republic of China

Supervisor: Professor Yoshitoshi Tanaka

Tokyo Institute of Technology

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1. Observation and Discussion

1.1 Patent utilization

1.2 Patent management in enterprises

1.3 Function of government patent office

2. Conclusion

Abbreviation

Reference
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Abstract
In recent years, application number of patents in the world is growing, wherein, the five largest patent offices called IP5 including USPTO, EPO, JPO, KIPO and SIPO account for 90% of all patent applications filed worldwide and for 93% of all work carried out under the Patent Cooperation Treaty, in 2011, among the large number of grants, the combined shares for grants of IP5 account for about 79% worldwide. More and more IP offices have to confront the tough task to eliminate backlogs and accelerate examination. To improve the efficiency of examination, IP offices have adopted many measures such as hiring more examiners and strengthening examination framework.
On the other hand, there are a lot of patents that are never utilized by patentees. According to a JPO’s survey of IP activities, from 2006-2010, about 50% granted patents were not utilized, and according to an European survey, averagely, there are 34% grants were not utilized in EU. Why there are so many unutilized patents? Is it a result of management strategy of enterprises or an unexpected phenomenon? How should government patent office do as facing this situation? The research summarizes different modes of patent management and strategy, the situation of patent utilization and the reasons of un-utilized patents in companies by analyzing the results of interviews to six Japanese large companies. Furthermore, the research summarizes national IP strategy in IP5 and supporting policy in Japan and China.
At last, the research discusses patent management modes in different countries, technical fields and size of companies. Meanwhile, the research put forward some advices about guide policy for government patent offices to decrease the number of unutilized patents. If government could guide enterprises to reduce the applications of un-utilized patents, it would be very helpful to reduce examination backlog of patent offices and improve the efficiency of examination, as well as accelerate technology development.

Keywords: patent utilization  patent management  IP strategy  policy
Chapter I-Introduction

1. Background

Modern patent system has developed in some developed countries and regions for over hundred years and plays a more important role in economic activities. In 21st century, patent begins to become hotspot in Asian countries, especially in China and Korea. The five largest patent offices in the world called IP5 including USPTO, EPO, JPO, KIPO and SIPO account for 90% of all patent applications filed worldwide and for 93% of all work carried out under the Patent Cooperation Treaty (PCT) \[1\].

In recent years, the five IP offices have large application numbers year by year (see Figure 1). For example, in China, patent application number received by SIPO reached more than 520 thousands in 2011 with increasing rate having remained over 10% for ten years except 2009. In Japan, the number of patent applications filed in 2011 was still more than 340 thousands although the number has been gradually decreasing since 2006 \[2\]. More and more IP offices have to confront the tough task to eliminate backlogs and accelerate examination. To improve the efficiency of examination, IP offices have adopted many measures such as hiring more examiners and strengthening examination framework.

On the other hand, there are a lot of patents that are never utilized by patentees. According to a JPO`s survey of IP activities \[4\], from 2006-2010, about 50% granted patents were not utilized, wherein 30% patents are used for defence,
and 19% are not utilized at all. Why there are so many unutilized patents? Is it a result of management strategy of enterprises or an unexpected phenomenon? How should government patent office do as facing this situation? The research will analyze the reasons of unutilized patents in companies by summarizing patent management strategies of enterprises. Furthermore, the research will put forward some advices about guide policy for government patent office to decrease the number of unutilized patents. If government could guide enterprises to reduce the applications of unutilized patents, it would be very helpful to reduce examination backlog of IP offices and improve the efficiency of examination, as well as accelerate technology development.

2. Situation of patent utilization

2.1 Situation of grants worldwide and in IP5

Today, as we are evolving to the knowledge society, the number of granted patents becomes one index of evaluating the value of a company. In 2011, grants worldwide approached the one million mark and patent grants grew by 12.3% in 2010 and 9.7% in 2011.[3]

In 2011, among the large number of grants, the combined shares for grants of IP5 account for about 79% worldwide.
2.2 Situation of utilization of patent grants

The large number of patent grants worldwide and its continuously increase indicates highly active in technology development. However, does every granted patent play a role in enterprise development and technology innovation? It’s an issue which should be concerned and discussed.

1) Situation of utilization of patent grants in Japan

According to a JPO’s survey of IP activities, from 2006-2010, about 50% granted patents were not utilized\(^1\), wherein 30% patents are used for defence, and 19% are not utilized at all. \(^4\).

---

\(^1\) In JPO’s survey, utilization means the total number of cases utilized in a company and those transferred to other companies, excluding duplicate cases.
Figure 4 Utilization of patent grants in Japan [4]

Among all fields of technology, mechanical appliance manufacturing for business accounts for the highest utilization rate, followed by construction and mechanical manufacturing. The utilization rate of grants in top three fields is over 60%. And the least utilized three fields are education, TLO (Technology Licensing Organization), public institutes and governments, Pharmaceutical manufacturing industry, and transportation mechanical manufacturing, in which the utilization rate of grants is only around 40%.

Figure 5 Utilization of patent grants by field of technology [4]
2) Situation of utilization of patent grants in Europe and other countries

In May 2003, a large-scales investigation called PatVal survey started, and ended in January 2004. The questionnaire was submitted to the inventors of 27,531 patents granted by the EPO with a priority date of 1993–1997, it covers all technological fields, deals with both for-profit and non-profit applicants, and collects information on small, medium and large business companies. Based on data of this survey, research is carried on in various perspectives. One is Tender n° MARKT’s report in 2006[^5], utilization of grants in eight European countries was analyzed. Result shows that, averagely, 16.9% patents were "blocking patents", and 17.1% granted patents were "sleeping patents", totally 34% grants were not utilized[^2] in EU.

![Figure 6: Share of unused patents by country, 1993-1997][^5]

Wherein, small firms use 80% of their patents, whereas large firms use slightly less than 60% of their patents, and medium firms use about 75% of their patents.

[^2]: In MARKT’s report, the utilized patents mean the patent was used internally by the patent owner for industrial or commercial purposes; or was licensed to third parties.
MARKT also did similar analysis to a JPO, different utilization ratio in multiple fields of technology is listed in this report. Pharmaceuticals and Transport still possess higher un-utilization ratio than the average data, and in fields of mechanical appliance manufacturing for business and building, more patents are utilized.
Other researchers Giuri, et al.\(^{[32]}\), provided unused patents (Sleeping patents) according to technical fields and size of companies. In Giuri’s paper, organizations as private or public research institutions, universities and government institutions are listed with all sizes of companies but other technical fields. Although the technical fields here are very limited, various percentages of purposes of use are so detailed.

<table>
<thead>
<tr>
<th></th>
<th>Internal use (%)</th>
<th>Licensing (%)</th>
<th>Cross-licensing (%)</th>
<th>Licensing and use (%)</th>
<th>Blocking competitors (unused) (%)</th>
<th>Sleeping patents (unused) (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical Engineering</td>
<td>49.2</td>
<td>3.9</td>
<td>6.1</td>
<td>3.6</td>
<td>18.3</td>
<td>18.9</td>
<td>100.0</td>
</tr>
<tr>
<td>Instruments</td>
<td>47.5</td>
<td>9.1</td>
<td>4.9</td>
<td>4.3</td>
<td>14.4</td>
<td>19.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Chemicals and Pharm</td>
<td>37.9</td>
<td>6.5</td>
<td>2.6</td>
<td>2.5</td>
<td>28.2</td>
<td>22.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Process Engineering</td>
<td>54.6</td>
<td>7.6</td>
<td>2.0</td>
<td>4.9</td>
<td>15.4</td>
<td>15.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>56.5</td>
<td>5.8</td>
<td>1.8</td>
<td>4.2</td>
<td>17.4</td>
<td>14.3</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>50.5</td>
<td>6.4</td>
<td>3.0</td>
<td>4.0</td>
<td>18.7</td>
<td>17.4</td>
<td>100.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Internal use (%)</th>
<th>Licensing (%)</th>
<th>Cross-licensing (%)</th>
<th>Licensing and use (%)</th>
<th>Blocking competitors (unused) (%)</th>
<th>Sleeping patents (unused) (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large companies</td>
<td>50.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.2</td>
<td>21.7</td>
<td>19.1</td>
<td>100.0</td>
</tr>
<tr>
<td>Medium sized companies</td>
<td>65.6</td>
<td>5.4</td>
<td>1.2</td>
<td>3.6</td>
<td>13.9</td>
<td>10.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Small companies</td>
<td>55.8</td>
<td>15.0</td>
<td>3.9</td>
<td>6.9</td>
<td>9.6</td>
<td>8.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Private research institutions</td>
<td>16.7</td>
<td>35.4</td>
<td>0.0</td>
<td>6.2</td>
<td>18.8</td>
<td>22.9</td>
<td>100.0</td>
</tr>
<tr>
<td>Public research institutions</td>
<td>21.7</td>
<td>23.2</td>
<td>4.3</td>
<td>5.8</td>
<td>10.9</td>
<td>34.1</td>
<td>100.0</td>
</tr>
<tr>
<td>Universities</td>
<td>26.2</td>
<td>22.5</td>
<td>5.0</td>
<td>5.0</td>
<td>13.8</td>
<td>27.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Other Govt. institutions</td>
<td>41.7</td>
<td>16.7</td>
<td>0.0</td>
<td>8.3</td>
<td>8.3</td>
<td>25.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Other</td>
<td>34.0</td>
<td>17.0</td>
<td>4.3</td>
<td>8.5</td>
<td>12.8</td>
<td>23.4</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>50.5</td>
<td>6.2</td>
<td>3.1</td>
<td>3.9</td>
<td>18.8</td>
<td>17.5</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Direct data about unused patents from USPTO or any research has not found yet. But there are some surveys about situation of patent application and utilization in US companies. In NAGAOKA and WALSH’s survey which were conducted in 2007 separately in Japan and US\(^{[6]}\), the licensing propensity of a large firm is lower than a medium or small firm both in US and Japan. In US, about 24% of triadic patents\(^3\) remain non-commercialized purely for non-strategic reasons, which is the same as in Japan. Moreover, it is said in an article\(^{[7]}\) that about 60% of patents owned by large companies are not utilized in Korea. But the details and source of the data are not mentioned in that article.

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3 In this survey, triadic patents refer to those for which a patent was granted by the US patent office and applied for at both the Japanese and European Patent offices.
Unfortunately, no relevant data and information about utilization of patent grants in China are found. With sharp increase of patent applications and grants, utilization of patent in China will be focused. Any relevant survey or report will be paid high attention.

3) Reasons of un-utilized patents

Y. Tanaka points out [29], the quality of IP activities, such as patent strategy making, decision for patent applications, patent practical work, will make influence to generate un-utilized patents, among which the lack of integration between IP department and other functional departments, like marketing, business and planning departments, in the enterprises is thought as one of critical factors.

MARKT [5] also analyzes some reasons for unused patents. Large firms have larger R&D budgets, they sometimes produce by-product and non-core innovations that are patented but not used. Second, IP department of larger firms have a greater propensity to file potentially usable or licensing patent for strategic reasons. By contrast, small firms face greater costs of patenting, if they patent, they plan to use the innovation and enjoy returns from it.

More unused reasons will be discussed combined with analysis of company interview in Chapter II.

3. Function and role of government patent office

3.1 Mission of government patent office

The Patent System added the fuel of interest to the fire of genius`, this well-known saying from Abraham Lincoln indicates the true essence of patent system. Since it was founded in 17th century in England, it has played a key role in promoting innovation. Most countries have established patent law and national patent office to implement and administer patent system, the general mission of a patent office is to offer the patent owner the recognized means to protect his/her idea or innovation from infringement by a third party without prior approval [8].
As the rising of developing countries, patent system is no longer exclusive in developed countries. Patent system emerged in most developing countries and has improved rapidly based on the efforts of their national patent offices. Today, most of government patent offices are at least responsible for trademarks, or designs and utility models in addition to patent. Meanwhile, in order to fulfill the requirement of economic development, responsibility of government patent offices expands to patent information management and usage, IP enforcement, patent data publishing, and the use of patent system promotion etc.

With economic globalization, most countries have joined international organizations or treaties such as WIPO and PCT. Nowadays, undertaking the duties of member of international organizations and developing collaborations with other offices become important responsibilities of government patent offices.

3.2 New challenges since the end of 20th century
Since the end of 20th century, government patent offices both in developed and developing countries face new challenges as coming of era of knowledge economy. Some countries released National IP Strategy to promote the IP system in these countries. To implement the National IP Strategy, a series of programs or plans are established to urge patent application and protection, revision of patent act, usage of patent information, training of IP human source, etc. Meanwhile, in order to effectively promote the development of economy and society by these programs or plans, closer collaboration between patent office and other government departments are required, which is so different from the traditional work of patent office and becomes a new task in front of it.

Along with globalization and more residents to apply overseas, government patent offices need to promote collaborations with other offices and international or regional organizations. Most government patent offices enhance external cooperation to make their work more effective and keep pace with international development. The comprehensive communications among IP5 aim to larger benefits of worksharing and more efficient examination [1]. Nevertheless collaboration among IP5 is fruitful, it still needs a lot of efforts to reach overall agreement and harmonization of examination standard. Cooperation between
government patent offices has covered both search and examination such as PPH, documentation exchange, information usage, classification, training and quality management.

For each government patent office, the most tough and urgent task is to eliminate backlog as the rapid increase of patent application all over the world. Most offices implement various measures to increase examination capacity and shorten examination period to satisfy their applicants. It seems that hiring more examiners is the most common measure so far, however, training new examiners takes time so we can’t expect to see results rapidly, but we can expect to see them improved in the future\cite{34}. Hence, PPH and outsourcing search are other measures to speed up examination.

![Change in the number of examiners in IP5](image)

**Figure 9** Change in the number of examiners in IP5
Chapter II- Patent management and strategy of enterprises

1. Effects of patent on development of enterprises

Traditionally, the patent system has been seen as creating benefits related to innovation and simultaneously creating social costs related to competition [23]. When companies research a new product or technology, they file patents to ensure themselves to use freely and exclusively. On the other hand, publics can get details about the product or technology from the disclosed patent document and improve it based on the patent. Therefore, patents are one of few legal means for companies to obtain a temporary monopoly in a specified field of technology which makes patents particularly valuable to companies [24].

Company not only promotes technology research and development internally by filing patents, but also could directly realize value from patent portfolios, wherein three common ways are litigation, licensing and sale. Litigation often brings the highest level of revenue to the patent holder, and a successful licensing campaign can bring in significant revenue streams for a patent holder. Compared with the two ways above, the sale of patent assets is the most direct approach for revenue realization [25].

Along with change of economic situation and more functions of patent being found, the role of patent in company management is not restricted to protect invention. Patents are used to prevent rivals from developing in some technical fields even though the company itself has no intention to involve in this field. Patents are also used as bargain chip for technical exchange with other enterprises and protecting company from litigations with competitors, even an attack weapon by suing rivals infringement. Patent has gradually turned from a kind of management duty to a strategy, and is combined with business decision of a company.

In knowledge-based economy, intangible assets have become essential for productivity and economic growth [26]. In addition to the traditional benefits gained by these patents, the patents themselves become an important intangible asset.
Kamiyama, et al. [27] think that Intellectual assets such as patents, trade secrets, are widely considered important contributors to business performance and economic growth, perhaps more than tangible assets such as real estate and plant and equipment, and play a central role in business management and policy making. Firms increasingly and actively use IP assets, especially patents, to create company value. The value of patents boosts more and more big companies to obtain huge number of patents. However, large number of patents does not equal fat profit, the cost of patent can vary greatly during its protection period, and not every patent has equal worth. Some patents are practically worthless, while others are extremely valuable. Most patents have very little worth because they protect ideas that have no commercial application. This was shown or exampled by a survey [5], they find that 54% of the total value of these patents is concentrated in the 5 patents worth 50 million Deutsche Marks or more. Research of Hall et al. (2000) [27] shows that highly cited patents are highly valued by markets. Firms with very highly cited patents (more than 20 cites per patent) showed a 50% increase in value relative to firms with the same R&D and patent stocks, but with the median citation intensity.

2. How companies manage their patents?

As patent is getting to play an important role in management and business of companies, way of patent management changes a lot. In the past, IP department was easily ignored, in some firms, work related patents was just fulfilled by R & D staffs. Nowadays, almost every big company has professional IP department, in many companies, IP department participates in business and strategy decision in company and links R & D and business departments well. At present, management ability of patent to some extent reflects the management level and strength of a company.

In Florian Jell’s book [26], patent management has two major duties. The first concerns internal management of patents which consists of running the IP department and organizing its interaction with other department (e.g., filing of
patent applications; providing information from patent documents). The second one is external management of patents which involves a company's interactions with the intellectual property rights of other firms (e.g., managing licensing and litigation).

After analyze outcomes of an IP activity investigation of the KIPO in 2007, SEO Kyung et al. report that \(^{[28]}\), the companies holding exclusive IP departments has better outcomes than the ones with IP departments concurrently doing another work, and the companies holding IP departments concurrently doing another work were better than the ones without any IP departments. Especially, an exclusive IP department has an effect on a company's IP activity and strengthening of IP competence of a company.

Taylor et al. summarized several modes of patent department in firms \(^{[23]}\). The most basic form of patent management is a chief engineer of chemist who is responsible, among other duties, for general patenting matters, if patenting becomes more important, a dedicated patent officer will be nominated. This basic form is common in SMEs. For large companies, they have a fully developed patent department, which is typically centrally located and close to the company's headquarters, most professional patent work is handled within the department. Often, it is supplemented by individuals or smaller units at other company R & D or production sites.

A big company thinks that the intellectual property and the management are as a package, IP department should provide service such as analysis of patent information about technology development and rivals, strategy advice, etc. Moreover, IP department usually collaborates with both business and R & D departments, it could be a bridge to correlate these departments and improve efficiency of internal management. Nowadays, many large companies have put forward their own IP strategy. Y. Tanaka \(^{[30]}\) categorized 19 IP strategies suitable for various companies, which are integrated with fundamental strategy based on the corporate objectives, and the analysis of external environment and internal resource.
Filing applications is an essential of IP department, many companies believe that filing number represents strength of a company and filing number should always rise to show they have a better performance than last year. However, David B. Orange [25] doesn`t agree this. He thinks that for a company, setting of hard numeric targets can drive activity levels upward, but may also encourage pursuit of relatively less valuable cases for the sake of meeting the numeric goal. Also, there is a tendency to rush to meet the activity target at the end of the measurement period such as year-end, leading to hasty and uninformed decisions to file and associated costs.

3. Company interview and comparison of different management strategies

For understanding patent management in Japanese company, I visited 6 large companies in Japan. In existing literatures, large company uses less patents than SMEs, interviews to large companies are helpful to understand how they manage patents. There are both comprehensive field companies and special technical field companies, the six companies are representative of capital A-F separately. Interview questions include three parts which are patent management, patent utilization and opinions to government, and these questions are submitted to each company in advance. In my interview, un-utilized patent only means sleeping patents.

3.1 Patent management

Situations of patent management are shown in table 1.

<table>
<thead>
<tr>
<th>Company</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of employees in IP department</td>
<td>More than 200</td>
<td>Less than 50</td>
<td>More than 200</td>
<td>100-200</td>
<td>Less than 50</td>
<td>50-100</td>
</tr>
<tr>
<td>Duty of IP department</td>
<td>Filing, register, litigation, license, information supply, IP strategy, etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When evaluate Patent</td>
<td>a,b,c,d</td>
<td>a,b,c,d,e</td>
<td>a,b,c,d</td>
<td>a,c</td>
<td>a,b,c,d</td>
<td>a,b,c,e</td>
</tr>
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</table>

Meaning of a-e refers to detailed analysis in this section.
<table>
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<tr>
<th>How often do you evaluate grants?</th>
<th>Every year</th>
<th>Every year</th>
<th>Every year</th>
<th>Every year</th>
<th>Every year</th>
<th>Every year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any collaboration with function departments?</td>
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<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Could join marketing strategy decision?</td>
<td>As appropriate</td>
<td>As appropriate</td>
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<td>no</td>
<td>As appropriate</td>
<td>no</td>
</tr>
<tr>
<td>Application requirement every year?</td>
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<td>yes</td>
</tr>
<tr>
<td>Additional reward system?</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>

Table 1 situations of patent management in six companies

The number of employees in IP department depends on the scale of company, there are far more employees for IP work in comprehensive company than special technical field company. In comprehensive company, the number of employees in IP department is over 100, even more than 200, and in special technical field company, about 50 persons are engaged in IP work. Since comprehensive company covers several totally different technical fields, people with all kinds of professional knowledge are necessary. Furthermore, for keeping the advanced position in every area, comprehensive company has to apply many patents in each field so that the patent number is huge and more employees are needed to handle the related work produced by so many patents, which is another main reason why it has more IP employees. All six companies include several divisions in IP department. They are responsible for filing, register, litigation, license, information search and supply, IP strategy, and so on. This shows that IP department in big companies has complete organization and explicit division of labor. Before applies, IP department has enough communication with R&D or business department in these companies. After inventor in R&D submits the application, IP department will give advice to R&D about if this invention should be applied for a
patent, and discuss the direction of application and scope of claim. Usually, IP department decides whether to apply, sometimes, according to concrete organization structure in each company, R&D or business department makes the final decision, that is, the department which controls budget decides.

About the evaluation work in company, I asked “When do you evaluate your application or patent?

a. before application                      b. during the examination procedure
c. after being granted                   d. when utilizing                    e. other times”.

All companies select that they evaluate their patent rights before application and after grants. Some company’s selection includes during the examination procedure, when utilizing and other times. After grants, all companies evaluate their patents annually such as before they pay annual fee for patent or reward the inventors based on internal awarding system. IP department do this work with R&D or business department, all companies admit it’s a huge work for them, however they must do since it’s very important to company.

During evaluation, the main aspects companies consider are whether a patent has any value in business development or overseas market expansion, whether a patent is useful for research of new product, whether a patent is compliance with the future direction of business development in company, as well as not infringing others or being infringed and the relationship with competitors. Generally, the results of estimation are maintaining, abandoning, licensing or assigning.

In my interview, business value is the most primary factor company considers, next is internal use. This means for large company, the main purpose to file and maintain a patent is business development and strategy, profit in short-term is not a factor considered by a big company, it has the budget to maintain some patents for strategic reason but to use. Hence, it’s easy to understand higher un-utilized rate in large company than SMEs.

IP department in each company has a good cooperation with R &D, and has some cooperation with business departments. Between IP department and R &D, most usual collaboration is patent filing, they communicate and discuss to decide
whether to apply and how to draft. With business or planning department, IP department generally puts forward advice when business or planning department makes a decision or strategy, the advice relates to present technical direction, information of rivals, patents distribution in interested countries, etc. Moreover, communication is necessary when company would like to license in or out some patents. IP department in some companies also discusses with R &D before it publishes a new product to prevent infringement.

However, the position of IP department is different in each company. Only one company’s IP department always joins marketing strategy decision, others only join or give advice when IP information is necessary, in some large companies, IP department could not join. This shows that even in big company, IP department is still in a subordinate position and only acts passively under requirement of business department. In general, IP department has more collaboration with R &D than business, IP information effects the whole process of R&D, while profit is premier goal of business department, they consider many non-technical factors when make a decision, therefore sometimes IP seems not important. Although company knows the importance of patent theoretically, not every administrator could implement in actual operation of management.

Half companies have requirement of application number every year, the other companies apply according to actual sales and R &D activities. Depending on different organization structures, the number and budget of patent application every year are decided by business, R &D or IP department. Companies can objectively look upon application number and have realized that only huge number of patents could not bring profit for them.

Except reward system ruled in Japanese law, every company has an internal reward system to award inventors of patents, especially when the patent produces profit by being utilized or licensed. Some companies award every inventor after filing or grant, while some companies just reward staff who creates an outstanding invention.

About overseas application, market and rivals in a foreign country are main aspects company considers. Almost all companies have willing to increase
overseas applications and PCT application is the most common route so that they have more time to decide which country to enter. It shows that Japanese companies have realized the importance of overseas market and it’s a main development way to expand business abroad. Furthermore, some company would not increase overseas applications blindly, its IP department will advise not to apply too many applications in country without good protection environment.

### 3.2 Patent utilization

<table>
<thead>
<tr>
<th>Company</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>A burden to maintain?</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>ratio of unused patent</td>
<td>secret</td>
<td>Never count</td>
<td>Secret, JPO’s survey is exact</td>
<td>20%</td>
<td>30%</td>
<td>45%</td>
</tr>
<tr>
<td>Influence your development?</td>
<td>Not clear</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>Not clear</td>
<td>yes</td>
</tr>
<tr>
<td>Which one accounts more? Domestic or overseas?</td>
<td>Not clear</td>
<td>overseas</td>
<td>domestic</td>
<td>domestic</td>
<td>domestic</td>
<td>domestic</td>
</tr>
<tr>
<td>Any actions to decease?</td>
<td>yes</td>
<td>Not yet</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>

Table 2 situations of patent utilization in six companies

Almost all companies answered yes when they are asked if it’s a burden to maintain a large number of application and grants, the only one who said no also has a strict budget control of applying and maintaining. However, no company would reduce their applications only due to the fee, it’s a big burden they could afford.

As a very sensitive question, half of six companies prefer to keep their ratio of unused patents as secret, even the companies who gave me answer would not
like to publish their names. For company B, they think they do good assessment for their grants and try to abandon every no-use patent, so they need not count their unutilized patents. For company C, they would not like to publish the ratio, but they agree JPO gets a exact data of 20% unutilized ratio in every year` survey, therefore, we could deduce company C has a similar ratio to JPO`s survey. For company F, we think the so high ratio relates to its special technical field which has a close ratio in European investigation.

Here, the unused patent only refers to sleeping patents, if plus blocking patents, the ratio will much higher. From known answers, the lowest un-utilized ratio in company D is a little higher than percent of JPO’s survey which is about 19%, while ratios in companies E and F are much higher than 19%. As data of JPO’s survey comes from mean value of both large company and SMEs, and the companies I interviewed are all large companies, we could infer that in Japan, large company has more unused patents than SMEs.

Half companies don`t think that the un-used patents will influence their development, and within the other three companies, two companies` answers are not clear and yes. The company B who said no believes that they have evaluated all patents, hence it will not influence them greatly. For this question, companies E and F who has 30% and 45% ratio select not clear and yes, more unused patents at present make company not sure if these patents could be used in future as they wish and this uncertain factor will affect the development of company more or less.

Most companies process more unused domestic patents than overseas one. In the past, Japanese companies were willing to first file in Japan when they have a new invention, then decide whether to apply overseas based on prior Japanese application, so they usually have more domestic applications which leads to domestic patents account more in their unused patents. In recent years, as many Japanese companies choose PCT route to entry foreign countries and have more willing to expand overseas markets, applications outside Japan will increase. Furthermore, the main aim for some companies filing abroad is to
occupy market in some countries, they won`t use the patents recently, which will lead to more un-utilized overseas patents in Japanese companies. Even some companies didn`t answer the unused ratio, they all gave me some reasons why they don`t utilize patents. The main reasons are: 1) it`s difficult to decide whether maintaining or abandoning at present; 2) to defense or block competitors; 3) the technology is too advanced to use in present market; 4) they keep this patent for future use or license; 5) one success product needs not only core patent, but also many peripheral ones to support, these peripheral perhaps are never being used, but they do have function to ensure the utilization of core patent; 6) to prepare for business strategy or change; and 7) in some areas, companies have to maintain a large number patents to prevent them from being sued by other rivals.

Through above reasons, it can be seen that, most unused patents are strategically maintained, large companies strategically use patents in their management, they file applications prepensely and maintain some grants purposefully. When it`s difficult to make a decision whether to keep, they usually select to maintain this patent and do not abandon a patent rashly. Large companies have to maintain patents in several technical directions to ensure their leading position and market share in future. Furthermore, large companies possess more advanced technology than SMEs, some technology is not mature enough to be applied in current market, while for other technology, companies are not sure which one will have commercial value in future, the most reliable way is to maintain the patents and wait.

All companies think careful annual assessment of patents is the most common measure they take to decrease un-used patent, some companies will set a benchmark to maintain their patents around a fixed number. Obviously, annual assessment is the main and direct way for company to learn the situation of their patents, meanwhile, companies think this is the most effective way.

### 3.3 Opinion on policy of government

Six companies often concern patent information published by JPO and think the information is useful. The useful information includes IPDL, examination
guideline, overseas IP information, IP related laws, trend development report of special technical field, statistic data of all kinds of technical field, and so on. This kind of information is very helpful for companies to learn IP system, both domestic and overseas, as well as technical development trend in some field since it’s very difficult to obtain competitors’ information which is generally not published. PPH between JPO and other patent office is mentioned by some companies too, but they cannot estimate it yet as PPH is still at the beginning stage and not so popular like PCT.

Among six companies, four know Japanese Intellectual Property Policy Outline and Intellectual Property Strategic Program, two answered not clear. One of the four companies express they only heard the title of policy, but know little about details, and the other three companies think the policy is helpful to their development because they could formulate their own development plan according to government’s policy. However, some companies don’t feel too much change after the policy was implemented and they are not familiar with the promoting plans in the Strategic Program.

When were asked if government patent department should take some measure to decrease the number of un-utilized patents, all companies definitely answered no except that one answered not clear. All companies think they should decide by themselves how to handle their patents, while government should focus on stuff in higher level such as policy making. The exceptional company explained that government tried to take some measures to decrease the un-used patents before, but didn’t acquire obvious effect, they don’t know if government could put forward some effective measure.

Regarding to suggestion to JPO, first, companies appreciate JPO’ work as JPO has been made great efforts and obtained satisfying performance. Secondly, they hope JPO will go on and get better if following aspects are promoted: 1) keeping on push global harmonization of patent examination standard; 2) machine translation of Chinese and Korean document and construction of search database; 3) revising examination guideline; 4) promoting license market in
Japan, and 5) urging foreign countries to improve IP protection and enforcement environment.

Finally, about license market in Japan, most companies think license market in Japan is not as active as US and EU, even if government has plan to promote Japanese license market, apparent change and improvement are not seen yet. Government is expected to establish more intermediary organization to facilitate publishing and exchanging of license information. Even now some large companies have increased patent license in and out, it is still not enough compared with US companies.
Chapter III-Supporting policy by government

1. National IP strategy
   As knowledge economy society coming, in some countries, Intellectual Property means not only an important function of related government department, but also a basic policy to develop the economy in these countries. Many governments in those countries drafted and launched national IP strategy. World Intellectual Property Organization (WIPO) lists twenty-three governments which have released their IP/Innovation strategies/plans. Among the twenty-three countries, both developed and developing countries are covered, even in some countries the IP system is not so developed. Obviously, many governments think that it is an important new function for IP government departments to formulate and implement IP strategy.

   1.1 Definition of National IP strategy
   What is an Intellectual Property Strategy? WIPO’s definition goes as follow: [10]
   “An Intellectual Property Strategy also referred to as Innovation or Science and Technology Strategy or Plans are in some cases called Research and Development Plans.
   An IP Strategy is a set of measures formulated and implemented by a government to encourage and facilitate effective creation, development and management of intellectual property. It outlines how to develop infrastructures and capacities to support inventors of IP to protect, develop and exploit their inventions. An IP Strategy may also be defined as a comprehensive national document which outlines how all the policy developments and implementation take place in a coordinated manner within a national framework.”
   Also, a WIPO conference on IP strategy held in February, 2012 said, [11], “An IP Strategy is a set of policy measures formulated and implemented by a government to promote and facilitate the effective creation, protection, management and use of intellectual property as a strategic tool for economic, social, cultural and technological development.”
However, in Välimäki’s opinion\(^{[12]}\), this definition of WIPO sounds quite broad but still misses something if read against how strategy textbooks define strategy. Välimäki also suggests intellectual property strategies could be constructed to have a more market based approach as most of present day strategy focus on the rights-based approach.

### 1.2 National IP strategy in Japan

In February 2002, the then Prime Minister Koizumi proposed strategically protecting some results of research activities and creations by IP rights as one of national goals to enhance the international competitiveness of Japanese industries. This decision promoted Japan to change from an industry society to an intellectual society.

In order to ensure the realization of this goal, a Basic Law on Intellectual Property was enacted which was intended “to promote measures for the creation, protection and exploitation of IP in a focused and planned manner.” in November 2002. The Japanese government established the Intellectual Property Strategy Headquarters headed by the Prime Minister in March 2003 whose prime tasks are the creation and implementation of plans for intellectual property promotion. Similar institutions have been established throughout various regions in Japan. In July 2002, Intellectual Property Policy Outline was launched, and the Intellectual Property High Court established in 2005. As an annual plan, the Intellectual Property Strategic Program has been implemented from 2003 to 2012. The Japan government revises this program every year to make it fulfill present situation and requirements.

In Intellectual Property Strategic Program 2012\(^{[15]}\), it’s believed extremely important to utilize software power as Japan’s attractive IP and strengthen the IP system that includes the nurturing of advanced human capitals. To keep leading position in the new international environment, two comprehensive IP strategies are proposed which are Comprehensive IP Innovation Strategy and Comprehensive content strategies to boost Japan. Many tasks or goals are put forward and a broad scope contains international and domestic IP system, comprehensive IP management, international standardization activities, industry-
academic partnership, and comprehensive enhancement of ability of human
capital, etc. Meanwhile, any content in IP to promote Cool Japan plan is
emphasized and mentioned detailedly.
In addition to national IP strategy, Prefectural intellectual property strategies are
formulated by the initiative of municipal governments in Japan and Regional
Intellectual Property Strategy Headquarters have been established within each of
the regional Economy, Trade and Industry bureaus \[13\]. The regional IP strategies
are helpful to realize the goal of national IP strategy as they are set up with
different goals according to the particular circumstances of the regions in which
they are located.
The Program 2012 proposes work plan based on the global market, including not
only tasks for government but also advice for enterprises. Also, all tasks or plans
are well organized to be separately distributed to different government
departments and are classified to long, middle and short term programs. The
advantage of annually updated IP program is that the annual program with
specific aims accords with actual situation and is easier to implement by all
related participants. Välimäki also thinks that Japanese IP strategy do take the
actual use of intellectual property into account as it tackles issues bottom up from
the market perspective \[12\].

1.3 National IP strategy in other IP5 offices
IP system has well developed in US and been important engine of American
economy. US carries out IP strategy for a long time and has established a series
of IP strategic plans including 21st Century Strategic Plan (Interim Adjustments),
2007–2012 Strategic Plan and 2010-2015 Strategic Plan \[21\]. The strategic plans
include a detailed description of the activities to be undertaken in the coming
year, specifies objectives, means and performance indicators and give a
description of the target group per activity. The framework of the plans focuses
on quality, timeliness, protection and enforcement. In addition, USPTO sets forth
2011-2015 Strategic Human Capital Plan which addresses the future workforce
demands and challenges facing the USPTO and identifies the agency's specific
human capital management initiatives designed to overcome its challenges. The
Strategic plans in US are well scheduled and one goal is to provide domestic and global leadership to improve IP policy, protection and enforcement worldwide which is in line with the position of US in the world. European Union Industrial Property Rights Strategy was published in July 2008 which outlined actions to ensure Europe has a high quality industrial property rights system in the coming years. It complements the 2007 Communication on the patent system, which set out a way forward towards the adoption of a Community patent and an integrated EU-wide jurisdiction for patents \(^{[16]}\). And just in December 2012, the announcement of the foundation the unitary patent and the Unified Patent Court should be a achievement of implementing EU IP Strategy. It was a flaw that the EU IP Strategy didn’t refer to copyright which is indispensable in the concept of IP. Without copyright, EU IP Strategy is a little out-dated compared with Strategies of US and Japan. Although Välimäki \(^{[12]}\) thought EU IP Strategy rather focused on the acquisition of rights, the level of protection and enforcement without actual advice to companies and market participants, it really included the promotion policy and advice for SMEs.

China issued the outline of National Intellectual Property Strategy in July 2008. It is a comprehensive intellectual property strategy document covering all rights from patents to copyright and registered designs with purpose of improving China’s capacity to create, utilize, protect and administer intellectual property, making China an innovative country and attaining the goal of building a moderately prosperous society in all respects \(^{[18]}\). The outline also put forward a long-term strategic goal by 2020 and short-term strategic goal in the next five year. To implement the outline, China formulated the Promotion Plan for the implementation of the National Intellectual Property Strategy annually since 2009. In the plans, specific tasks for per year were determined and from 2012, related government departments to fulfill the task were assigned in the plan. Almost at the same time with China, Korea also delivered its Strategy for Realization of Powerful State of Intellectual Property. Korea IP strategy covered all types of intellectual properties \(^{[12]}\). Korea released the Basic Act on Intellectual Properties in 2011 and the Presidential Council on Intellectual Property was
established subsequently in the same year to act as an intermediary among
government ministries [20].

2. Interview to Japan Patent Office

To learn the supporting policies in Japan, I interviewed JPO. JPO’s answers to my questions are described below.

Q: The main national IP strategy or program in Japan?

Q: The supporting policies or measures for patent applicants in JPO?
A: We suggest that Japanese applicants to file applications overseas based on a global strategy instead of only filing in Japan, and about 30% at the global application rate of Japanese applicants is expected to achieve. Moreover, we advocate Japanese applicants to search prior art before filing and to consider the content of applications carefully. By this measure, about 20% of rate of decisions of refusal are expected to decrease.

Q: In the Intellectual Property Promotion Program 2012, comprehensive IP management in Japanese companies is considered even more important. Please introduce its Intellectual Property Human Capitals Development Plan.
A: There are three main measures in this 5-10 years plan. First, the research institute of IP management strategy is established to provide the newest IP strategy and analysis for Japanese enterprises. Second, based on support of experts and results of overseas research in the research institute, training institute for Intellectual Property Human Capitals will be built. Third, it will nurture human capitals and provide them with both IP knowledge and business management ability.

Q: From 2005 to 2012, JPO conducted the “IP activity investigation” every year. In the investigation, the number of exploitation of Japanese domestic patents is one survey item. How does JPO look on the un-exploited number of patents?
   a. too high                  b. a little high               c. normal
A: c. normal. The reason of the choice is that whether a patent could be utilized depends on multiple factors such as entity ability and entity level of R & D, business strategy and economic environment. Un-used patents may be utilized for future R & D and business, it’s unreasonable to seek for making use of every patent owned by a company. For JPO, if the number of un-utilized patents is so large that JPO have to hire more examiners to handle, they will consider to take some necessary measures to reduce the number. However, JPO will make its best effort to examine all applications in time even though the un-used patents will result in increasing their workload.

Q: Please introduce the current situation of license market in Japan?
A: (Although this is the responsibility of the Ministry of Economy, Trade and Industry (METI), we will supply some information we know.) There is a Japanese organization named Innovation Network Corp. of Japan (INCJ) handling a special fund, Life and Science related Intellectual Property (LSIP) in Japan. Japanese private companies as well as private companies from US manage IP fund.

According to the answers above, Japan government suggest Japanese company more focus on patent quality but application number. After years when the application number rose, Japan government has realized that not all patents could earn money, only high quality patents can bring benefit to applicants. Meanwhile, as economic globalizing, Japanese enterprises should more emphasis on overseas markets which is much larger than Japan and obviously Japanese technology has advantage than local companies in most countries. In Intellectual Property Human Capitals Development Plan, Japanese government more emphasizes comprehensive and advanced talents nurturing, which means that a person only knows how to draft and file an application is not enough, the person who knows both IP and business, and who has deeper understanding as well as overall utilization on IP is needed. This goal is in accord with the present situation in Japan and human capital is an important factor to realize the IP strategy.
JPO thinks about 20% non-utilized ratio of patents is normal and has no need to take any measures now. Since 2006, the number of patent application in Japan has declined slowly from 427,078 to 342,610, and the number of patent examiners has increased slightly. Hence, JPO could concentrate on solving the backlog problem and need not worry about the rapid increase of application number recently. However, JPO’s policy to promote quality of patents is a kind of measure to decrease invalid or impulsive applications, which will actually urge Japanese companies to evaluate their inventions carefully before filing and accordingly result in less un-utilized patents.

For licensing market in Japan, although this is not responsibility of JPO, they supplied me some information they know very kindly. However, effect of the organizations and private companies should be estimated by the government department who manages them.

3. **IP supporting measures in China**

Since SIPO was founded in 1984, patent system has been implemented for almost thirty years in China. Along with the rapid increase of Chinese economy, the performance of SIPO and development of IP in China also fix the world’s eye on this largest developing country worldwide. Now, as member of IP5 and with the largest application number in the world in 2011, SIPO continues to provide more supporting measures and service to applicants in China.

To promote innovation and usage of patent system, SIPO aims at infrastructure construction of utilization of information, consultation of application and examination from applicants, etc. Patent Search and Service System and Chinese Patent Inquiry System are available for public to search and analyze patent information or consult. More applicants file patents with E-filing system and until the end of 2011, the E-filing ratio reached 70%.
The Promotion Plan for the Implementation of National Intellectual Property Strategy in 2012, which was mainly led by SIPO, was also formally issued. In this plan, supporting to IP application of the burgeoning strategic industries is reinforced. Rights and interests of inventor of service inventions is legally guaranteed. Providing IP financial service to SMEs, a supporting system to provide service of patent financing and pledging to the public, training a number of national IP financing and pledging talents are also involved in this plan. To develop IP service industry and to foster IP culture are two main missions of the plan.
In 2011, SIPO established Jiangsu Patent Examination Cooperation Center and Guangdong Patent Examination Cooperation Center to fulfill continuously high increase of application number in China.

In 2010, IP education and training was actively promoted with the IP professional training mechanism continuously improved, and in 2011 SIPO released the 12th Five-Year Plan for IP Talents. SIPO provides training programs and textbooks for patent attorneys and about 800 persons joined the programs in 2011. SIPO published “Guide to Patent Information Utilization” and “Skills for Patent Information Utilization”, which were textbooks for advanced training series. SIPO issued the 12th Five-Year Plan for the Administrative Work of National Intellectual Property Office and the Guideline for Work on IPR Trusteeship for SMEs Clustering.

Meanwhile, SIPO pressed ahead the construction of “the Platform for Comprehensive Management of Documentation Resources”, which is put into use in 2012. “Electronic Documentation Resource Archives” to record the 382 kinds of documentation recourses of SIPO to fulfill the requirements of patent examination and public is built.
Chapter IV-Observation, Discussion and Conclusion

1. Observation and Discussion

1.1 Patent utilization
Among known literatures, there are more data of patent utilization in Japan and Europe, especially JPO investigates IP activities in Japan annually. However, before 2006, in JPO`s statistic data, blocking patents were not counted separately, thus we only discuss the data since 2006 in Japan. From 2006 to 2010, the average sleeping patent rate in Japan is about 19.42%, and the average sleeping patent rate of eight European countries in five years is 17.1%, which is slightly lower than Japan. Perhaps some factors, such as culture difference, development level of patent system, filing strategy between JP and EU are reasons why sleeping patents of European companies were less than Japanese companies, however, we should draw this conclusion more discreetly. Although both surveys were conducted almost in the same stage, wherein, PatVal survey was from 2003 to 2004 and JPO`s survey began from 2006, accurate quantitative analysis is very hard because samples came from different regions. Therefore, based on the unconspicuous difference, we prefer to consider Japan and Europe have similar unused rate of grants. However, obvious difference of patent use and blocking patent appears between two surveys. An average use rate of 66.0% in EU is much higher than 51.06% in Japan. And EU has an average blocking rate of 16.9% which is much lower than 29.48% in Japan. The difference obviously shows different usage pattern of companies in two regions. Japanese company applies more patents to block rivals, while European company utilizes more patent for internal use or licensing. According to analysis in Y. Tanaka’s paper [31], at the end of 1980s, because of the amendment of utility model law which shortened the period of protection, the application for utility model registration decreased and patent applications increased rapidly. Among the large number of patents at that time, utilization rate would be lower than other periods. On the other hand, Japanese companies
have more improvement inventions while European companies have more basic inventions. Generally speaking, basic patents will be utilized and only part of improved patents will be used, even though most of improved patents maybe unvalued, patent holder has to maintain them to ensure implementaion of other patents. As another reason, he also mentioned uncertainty avoiding culture in Japan \cite{31}, that is Japanese intend to prepare everything in advance and try to avoid any accident. Therefore, Japanese companies would like to apply more patents to block competitors and insure that they could develop in some areas without risk of infringement. In my interview, most companies also mentioned they do a lot of search and preparation to make sure not infringing the third party. Obviously, we should not arbitrarily conclude which kind of management pattern is better as Japan and EU have close sleeping patent ratio. Actually, the truth that Japan and EU both have been located in leading position worldwide perhaps proves they just have chosen the suitable way for them.

In NAGAOKA and WALSH’s survey conducted in 2007, there are 24% of triadic patents are not commercialized purely for non-strategic reasons both in Japan and US, which means companies in two countries have the same sleeping rate of triadic patents. As NAGAOKA and WALSH’s survey were almost in the same period with JPO, we could say companies in Japan and US have close ratio of unused patents to some degree.

SEO Kyung, et al. \cite{28} mentioned that IP Activity Investigation has been executed by Korean Intellectual Property Office since 2006 on general IP activities such as IP production, making Intellectual Property Rights, protection, exploitation and infrastructure. From this we could infer that KIPO has conducted similar investigation as JPO to learn the IP activities of Korean companies, unfortunately, no public English literature related patent utilization in Korea is found.

China attracts more attention in recent years by sharp rise of patent application. In China, Intellectual Property develops so quick that only part applicants understand the system and know how to utilize patents. In this stage, it`s not unexpected that few research relates to unused patents in Chinese companies as most focus on how to file and obtain a broader protection scope. Nonetheless,
with large number patent applications granted every year, more attention will be transferred to how to use patents to earn more profit for company and file a patent purposefully.

Below chart lists top three technical fields with high utilization rate in JPO`s survey and papers of Tender n° MARKT and Giuri. Here, blocking is not included in utilization. Although the classification of technical fields is not totally same wherein MARKT listed more fields than JPO` survey and Giuri lists only five, we still could find some similarity. For example, Agricultural & food proc-machin-apparatus is a kind of mechanical appliance manufacturing for business and Mechanical Engineering looks so close to mechanical appliance manufacturing, construction is almost same with civil engineering, building. Due to agriculture and food being an important industry in Europe, it’s not difficult to understand that Agricultural & food proc-machin-apparatus was a technical field alone. In traditional industry, more patents of these fields are internally used than in strategic defense, and the inventions usually could be utilized in current market rather than be applied in future.

<table>
<thead>
<tr>
<th>JPO</th>
<th>Mechanical appliance manufacturing for business</th>
<th>Construction</th>
<th>Mechanical manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>MARKT</td>
<td>Agricultural &amp; food proc-machin-apparatus</td>
<td>Civil engineering, building, mining</td>
<td>Consumer goods and equipment</td>
</tr>
<tr>
<td>Giuri</td>
<td>Process Engineering</td>
<td>Mechanical Engineering</td>
<td></td>
</tr>
</tbody>
</table>

Opposite to above chart, below chart lists three technical fields with lowest utilization rate in JPO` surveys and two papers. Here, blocking is included in unutilized patent. Obviously, they all show that pharmaceutical or chemistry field has low use rate of patent. In JPO` survey, education, TLO, public institutes and governments are listed with other technical fields parallelly, while Giuri looked upon them as organizations. In Giuri`s paper, public research institutions, universities and other government institutions have lower use rate of grants compared with other organizations such as large companies, SMEs. But, even
the lowest public research institutions whose unused rate is 45% is higher than similar organizations in Japan whose percent is over 60%.

<table>
<thead>
<tr>
<th>JPO</th>
<th>transport mechanical manufacturing</th>
<th>Pharmaceutical manufacturing industry</th>
<th>education, TLO, public institutes and governments</th>
</tr>
</thead>
<tbody>
<tr>
<td>MARKT</td>
<td>semiconductors</td>
<td>Macromolecular chemistry, polymers</td>
<td>Organic fine chemistry</td>
</tr>
<tr>
<td>Giuri</td>
<td>Instrument</td>
<td>Electrical Engineering</td>
<td>Chemicals and Pharm</td>
</tr>
</tbody>
</table>

1.2 Patent management in enterprises

Patent management style in company differs by several factors. First of all, technical field often influences patent application number and way to use in companies.

As we know, most researchers distinguish technology fields as `complex` and `discrete` technologies. Typical discrete field is drug or pharmacy, which means generally one product covers low number patents and company in this field is more independent to competitors. In contrast, fields such as electronic industry are complex technology, which means there are often hundreds of patents in one product and almost no company could control entire product, they have a closer relationship with rivals by cross-licensing with each other.

The most typical character in drug or pharmacy field is long period of R&D before a product is released, besides R&D has to do a lot of experiments and wait long time for being approved by supervision department. Therefore, drug or pharmacy company usually maintains patents for more than ten years before related product enters market, in addition, sometimes only part of patents could be transformed to a real product, and it’s difficult to make a decision whether to use a patent in a few years.

An electronic company often has large number of patent and is very active in licensing in and out. They have to file a lot of applications to block competitors and increase bargaining power in negotiations of cross-licensing of lawsuits. Hence, some patents in electronic field are not so valuable as patents in drug or pharmacy field, it’s the number of patents but patent itself plays a role in
competition with rivals. Due to development of electronic technology, new functions other than traditional ones of patent are found, and new patent management pattern in company appeared. In nowadays company management, patent is not the only way to monopolize technology. For some technology, company select knowhow instead of filing patent because they don`t want to publish the details of this technology which is a necessary requirement of patent. Knowhow is applied when company believes they can keep the technology secretly and remain advantage of its competitors. For one technology, it`s very hard for company to decide whether to apply a patent or keep it as knowhow, suitable use of knowhow is also important in company management. However, in some complex areas, especially in electronic field, development level of technology is so close that no company can possess one product entirely, secret is often meaningless. Oppositely, in drug or analysis area, in some occasion, knowhow is a wiser choice than applying a patent as competitors could hardly reproduce their product or technology.

Secondly, size of company generates different management modes as well. In a small company, IP issues are generally decided by an expert or R&D, if the company pays more attention to IP, sometimes the President or vice President will make the decision. For a big company, individual IP department is in charge of work related to IP and collaborates with other departments. Regularly, employee number of IP department increases with size of company, in my interview, there are over 200 even 300 employees in IP department of very large companies which cover diversified business, and less than 100 staff in ordinarily large companies which usually only cover specific technology area.

Filing and utilization of patent differ between large company and SME too. Even though the large companies I interviewed admitted that it`s a big burden for them to apply and maintain so many patents, they have to continue. Large company could afford this big budget to achieve their IP strategy goal, while SMEs prefer to consider their present or short-term profit. Hence, big company could maintain some patents for many years based on market or business strategy, SMEs tend to use every patent to increase income of company. This is also shown in Figure
7 where small firms use about 80% of their patents, medium firms use about 75%, while large firms use only 59%.

For most Japanese companies, patent information search is an important daily work, some big companies even develop their own searching database for internal use. In Pitkethy’s article this character is also mentioned [33]. In my interviews, all six companies search prior art both before filing, and before entering overseas markets or releasing a new product. Another change is that Japanese companies use more PCT route when first filing. At the past, they generally filed application in Japan and then file in other countries within 12 months based on Japanese priority, now, they could have more time to decide which country to enter by PCT route. This change means that Japanese companies begin to regard Japan as one part of global market rather than principle market.

1.3 Function of government patent office
According to the development level of patent system in each country, duty of government patent offices differs. In developed countries, such as US, Japan, German, GB, patent system has been founded for hundreds of years and been well popularized. Even though shortening examination period is a main task, it’s not the unique task. Companies in these countries expand new market as well as low-cost labor abroad to gain more profit, naturally IP becomes basic guarantee of this new business strategy. National government recognized the power of IP to economic and trade development, therefore accommodated the change. These countries launched either National IP strategy, or promotion plans and programs to provide better service for domestic applicants. The content of the strategy or plans involves nurturing advanced talents, enhancing patent quality, strengthening protection and enforcement, etc. to keep leading position worldwide.

In developing countries, including so-called BRIC countries, the primary task of government patent offices is still to popularizing patent system in their countries. The government in these countries has realized the importance of IP for future development, however most of people haven’t yet. Some people have been
aware of but know little about patent system, they just file applications without considering how to get a reasonable protection scope and how to use these patents. Once people realize the necessity and benefit of patent, enthusiasm of filing patents will result in sharp rise of application number in these countries. Some developing countries, such as China have been confronted with the challenge to handle huge number of applications. And in some developing countries, backlog has been or will be a serious problem for government patent offices to be solved. They have to hire more patent examiners while training new examiners takes times. During training of new examiners, an issue for offices in developing countries is that they don`t have enough experts engaged in training and they don`t have sufficient training experience as patent system in developed countries has just been founded for several decades. Furthermore, it takes some time, perhaps long time for applicants to realize that grant of patent itself is not enough, utilization of patent brings profit to them.

2. Conclusion

Today, global increase of the patent application number induces backlog in patent offices worldwide, particularly in patent office of developing country. Although patent offices are working diligently and have taken measures to eliminate inefficiencies, in some aspects, work in a more efficient manner is still expected. If quite a part of patents granted by patent offices are not utilized, it will not only reduce work efficiency of patent offices, but also impede technology development to a certain extent.

Based on analysis above, in developed world, traditionally identified as the United States, Europe, and Japan, average sleeping rate of patents is similar which is about 20%. In these areas, market economy has been highly developed, government generally does not interference behavior of enterprises directly, this is shown by my interviews to JPO and Japanese companies as well, both of them don`t think government should take some measures to decrease the number of unused patent in companies, which belongs to internal affairs of enterprise and should be decided by themselves. In this case, government maybe effect on enterprises indirectly by implementing some policies. For
example, all companies I interviewed think licensing market in Japan is not as active as US and Europe even though the market in Japan has been improved, some of them hope Japanese government could establish public licensing agency firm and afford more licensing information. An active licensing market will impel more unused patents to be used by the third party, and decrease the unutilized rate of grants in companies. Besides, revenue gained by licensing could increase income of company, and urge company to evaluate patents mainly in commercial aspect and abandon those grants without commercial value. Nevertheless, situation in developing countries is different. Even though there is no explicit data of unused rate of patents in these areas, we could almost infer that the rate will be much higher than developed countries because of undeveloped applying level in developing countries. It seems not a main problem for most developing countries now, but as the grants rise, this issue will appear sooner or later. It`s a better choice to settle this kind of issue by government as early as possible to prevent so many patents from being unused. In most developing countries, it takes long time for applicants to reach the same management level as developed companies, thus, if government takes more promotions to develop patent system and guide domestic applicants, it will be great helpful for applicants to utilize patent system more reasonably.
**Abbreviation**

**IP**: Intellectual Property

**IP5**: USPTO, EPO, JPO, KIPO and SIPO

**USPTO**: United States Patent and Trademark Office

**EPO**: Europe Patent Office

**JPO**: Japan Patent Office

**KIPO**: Korean Intellectual Property Office

**SIPO**: State Intellectual Property Office

**Large firm (company)**: firm with more than 250 employees

**Medium firm (company)**: firm with 100-250 employees

**Small firm (company)**: firm with less than 100 employees

**WIPO**: World Intellectual Property Organization

**EU**: Europe Union

**SMEs**: Small and Medium-size Enterprises

**METI**: Ministry of Economic, Trade and Industry

**R&D**: Research and Development

**PCT**: Patent Cooperation Treaty

**IPDL**: Industrial Property Digital Library

**PPH**: Patent Prosecution Highway

**BRIC countries**: Brazil, Russia, India, and China
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