

## 23 On Quality of Patent and Application Behavior Related to Patent Pool<sup>(\*)</sup>

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*Cases have been found where a patent pool is formed as a mechanism to license technical standard-related essential patents as a package due to increasing sophistication and complication of technology and the growing importance of intellectual property. We make a statistical analysis regarding the incentive to participate in the patent pool which varies with the characteristics of a pool-related company, and the difference in the patent-filing behavior. In particular, we use the U.S. essential patents managed by MPEG LA LLC like MPEG-2 and MPEG-4, standards of moving picture compression technology, as the object of analysis to examine in detail their relationship with the quality of a patent measured in terms of the utilization frequency of continuing applications and the number of citations. At the same time, by making a comparison to the trend seen not only in those essential patents but also in the total U.S. patents, we explain the characteristics of the technical standard-related essential patents. In the future, we want to discuss issues such as the incentive to participate in the patent pool and fairness among companies as licensors related to the pool.*

### I Foreword

In this paper, we make a statistical analysis of the relationship between the quality of patent pool-related patents and the utilization of continuing applications. So far, a number of patent pools have been operated in fields such as electricity, communications and broadcasting. And in connection with this, studies are being made from an economic or jurisprudential viewpoint. At the same time, the policy authorities in Japan, the U.S. and Europe, too, are going to take measures accordingly, such as the issuance of guidelines with respect to issues like the formation and operation of technical standard-related patent pools.

A patent pool is a mechanism in which a number of patents held by a number of patentees is licensed as a package. Many of the discussions on patent pools deal with their relationship with technical standards, and actually, many of the patent pools being operated nowadays are those in which

essential patents needed for conforming to a specific technical standard have been gathered together. For companies holding the essential patents regarding a specific technical standard, if a patent pool is formed and the patents are licensed smoothly, progress will be made in the diffusion of that technical standard, with royalty revenue expected to increase as well. And for licensees, too, it might be a desirable thing to be able to access the market of the goods and services without the technology being monopolized by some specific companies. In particular, in industries where network externalities strongly work, if there did not exist a mechanism like the patent pool, it would be difficult for the market to start and the standard specification, even if formulated, would become merely a standard on paper.

In order to form a patent pool, cooperation among right holders is necessary. However, such a cooperative relationship does not necessarily come into being in a smooth way. The analytical subject taken up

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in this paper is closely related to how such a cooperative relationship can be established among licensors.

The first point is related to the allocation of license revenue earned by the patent pool. As will be described in the latter part of this paper, as there also exist cases like the DVD patent pools which are said to have been unable to unify as one pool due to the different opinions regarding the method to allocate license revenue, it is recommendable that royalties should be allocated with a fair method so far as possible. Nevertheless, in order to prevent negotiations from becoming a mess, many patent pools have adopted the system to allocate royalties according to the percentage accounted for by an essential patent held by each member licensor. On the assumption of such a system, there is the incentive for each member licensor to increase the number of its own essential patents. In the case of the U.S., therefore, the system of continuing applications is said to be widely utilized. This time, in order to have a deep understanding of the quality of some individual patents in the current patent pools, we will evaluate an essential patent by the number of citations of that patent and concurrently make a statistical analysis of its relationship with the utilization frequency of continuing applications.

There is another main purpose. The incentive to participate in a patent pool varies with the type of company. Among the holders of essential patents, there exist various types of companies and it has been pointed out that the incentive to participate in a patent pool differs especially in cases of R&D-specialized organizations and vertically integrated companies which conduct both R&D and manufacture. We will make an analysis of how large a difference can be found in patent-filing behavior and the quality of a patent.

In this study the patent pool managed by MPEG LA LLC is used for analysis.

## **II Patent Pool**

### **1 Objective of analysis**

#### **(1) Allocation of royalties**

One of the issues is related to patent-filing behavior at the time of obtaining an essential patent in the patent pool, and to the percentage accounted for by an essential patent among licensors that have decided to participate in the pool as a result of the patent-filing behavior and the method to allocate royalty revenue among licensors.

There is not necessarily a lot of information available about the method to allocate royalty revenue within the patent pool. Kato (2006) stated: "Regarding the royalty allocation in a patent pool, the first issue to be faced should be whether the quality of an essential patent (such as the extent of the scope covered by the claims of each patent) should be taken into consideration or the allocation is calculated purely based on the number of essential patents. The conclusion is that in almost all of the current patent pools, royalties are allocated based on the number of patents." In the MPEG-2 patent pool, too, the amount of royalties to be allocated is determined according to the percentage accounted for by the essential patents held by each licensor in all of the patents in the pool.

The royalty rate of each patent pool has been lowered to a relatively small amount according to the RAND condition, but both the licensor and licensee sides have regarded the current royalty rate as a problem. As was intended by the competition authorities, with competition in the product market becoming keener due to the existence of the patent pools, it has become difficult for the licensors of the pool (which are producers as well) to earn excess profits from sales. In addition, as there also exist regions where it is difficult to collect licensing fees, as in the case of Chinese companies, the licensor side asserts that it is difficult to recover R&D costs. On the other hand, the licensee side asserts that for instance, regarding

DVD-related products, in addition to the licensing fee paid to each pool, a licensing fee should also be paid to the MPEG patent pool in order to concurrently utilize the picture and sound compression technology, thereby leading to an excessive amount of licensing fees in total.

If the pool cannot be unified and is split into several ones, this will lead to an excessive amount in licensing fees in total, and not only is this against the interests of licensees and by extension consumers, but licensors have not been able to maximize their joint profits which could have been obtained under normal circumstances.

In the case where royalties are allocated according to the percentage accounted for by the essential patents held by each company, there is a possibility that the system of continuing applications in the U.S. may be abused (in this paper, the continuation in part, the continuation application and the divisional application are expressed with the general term "continuing application"). There are cases where a continuing application is used for the purpose of adding new matters not yet known to the company at the time of filing and other claims.

The allocation of royalties in proportion to the percentage accounted for by a patent is considered as equal only when all of the patents have the same value. Increasing one's own percentage through low-quality patents by utilizing continuing applications leads to distortion of the allocation of royalties. Nagaoka et al. (2006), by means of the data of the essential patents held by the DVD patent pool, made a statistical analysis based on the average in units of company about the relationship between the utilization frequency of continuing applications and the quality of a patent measured through the number of citations. In this study, we decided to use the total U.S. patents managed by MPEG LA LLC to make a statistical analysis in units of patent.

## **(2) Incentive to participate in the patent pool**

The other point is the problem of the

incentive for companies holding essential patents to participate in a patent pool. Both in terms of economics and from a practitioner's viewpoint, it has been pointed out that there is a low incentive for R&D-specialized organizations to participate in a patent pool. If a vertically integrated company which conducts both R&D and manufacture participated in a patent pool by holding the essential patents, that company is both a licensor and a licensee. Along with licensing revenue earned by including its essential patents in the pool, it can also earn profits by producing and selling products by itself based on that technical standard. On the other hand, for R&D-specialized organizations like R&D ventures, as their profit-making source is no more than licensing revenue, they want a royalty rate higher than in the case of vertically integrated companies. Or, demanding a large amount of royalties as an outsider without participating in a pool can lead to more profits. The structural difference in earnings like this has brought about a difference in the incentive.

In reality, however, pure licensors such as universities, R&D-specialized companies and licensing companies, too, have participated in the patent pool. In this study, we want to make an analysis and add discussions in combination with factors such as the patent-filing behavior based on the difference in the type of company and the quality of a patent held.

## **2 MPEG LA LLC**

MPEG LA LLC, the object of analysis in this study, is a company operating a patent pool and was founded in 1996 for the purpose of licensing the essential patents for the MPEG-2 standard, a moving picture compression technology. As of January 2008, there existed nine pools, including MPEG-2, in which MPEG LA takes charge of management business. Eight pools as follows are used as the objects of analysis in this study: MPEG-2, MPEG-2 System, MPEG4 Visual, MPEG4 System, AVC/H.264, VC1,

### **III The system of continuing applications**

#### **1 Explanations of the system made in the U.S.**

As the documents required at the time of patent application, there are those such as the description and drawings which give a detailed explanation of the content of an invention, and claims in which the scope of requesting the grant of a patent right is described. A continuing patent application is utilized when the applicant has found matters to be added to the content of disclosure of the invention by continuing R&D also after filing the application.

In the continuation application and the divisional application, new matters cannot be added to the content of the invention described in the description but it is allowed to rewrite the claims described in the scope of right requested by the applicant. In contrast to this, continuation in part is a system which also enables the applicant to add new matters to the description. In the divisional application and continuing application, the interest on the filing date of the parent application can be enjoyed by the subsidiary application derived from the parent application. Regarding continuation in part, the content disclosed in the parent application alone can enjoy the interest on the filing date of a prior application, and regarding the new matters added thereafter, the filing date of the said application is applied.

In its relationship with technical standards, for instance, as was pointed out by Omachi (2007), by strategically utilizing the system of continuing application, the applicant “can also use the following method to obtain a patent: when preparing the claims after the filing, the applicant, by taking account of information about the conditions occurring after the filing date of the prior application, especially information about the products manufactured and sold by a third party such as a competitor or

about the formation of a technical standard, can contain the third party’s product in the scope of right or prepare the scope of request in such a way that it will become an essential patent for the technical standard.”

#### **(1) Condition of utilization of continuing applications**

If we examine the trend in utilizing continuing applications in each filing year based on the total registered U.S. patents, each case shows a very similar trend of change. First, the utilization frequency of continuing applications reached the peak in 1995. This is considered to be attributed to the impact of the law amendment in 1995, in which the term of the protected years of a patent was changed from 17 years starting from the date of registration to 20 years. The number of filed patents per se in the years right before the law amendment, too, increased, but as is shown by the graph, the rate of utilization of continuing applications rose as well, and 27% of the patents utilized a continuing application during the process of the completion. Later, the rate fell to approximately 12%, but recently, the continuation application and the divisional application in particular showed a rising trend. However, the utilization of continuation in part continued to fall consecutively from 1995 onward. There are discrepancies in the condition of utilization if judged from the field, but it is known that the utilization frequency is higher in chemical fields such as organic compounds and resins and in fields such as drugs, medical instruments and information storage.

Among the 290 U.S. essential patents in the patent pools managed by MPEG LA LLC which are the object of analysis in this study, there were 120 patents, or 40% of the total, for which a continuation in part, a continuation application or a divisional application was utilized during the process of completion. Furthermore, among the 290 essential patents, including the cases of deriving a subsidiary patent from a parent patent through a continuing application,

there are 150, or approximately 52%, for which a continuing patent application in a certain form was utilized either during or after the process of completion.

## **IV Utilization of continuing applications in U.S. and the quality of a patent**

### **1 The continuing application and the quality of a patent**

In Section III, we made an explanation of the system of continuing applications frequently utilized during the process of completion of a technical standard-related patent. Like the patent pools managed by MPEG LA LLC, in cases where the pool has adopted the system to allocate its royalty revenue according to the percentage accounted for by an essential patent held by a participating licensor, if a continuing application has been excessively utilized in contrast to the quality of that patent, as a result, there is a possibility for the allocation of royalties to become distorted, even though that is not done intentionally. In the following section, we are going to make an analysis of the relationship between the quality of an essential patent in the patent pool and the condition of utilization of continuing applications, but before doing so, first we are going to have a look at the trend viewed from the total U.S. patents.

As data indicating the quality of a patent, the citation information of a patent is used. As far as we know, there does not exist any study in which the utilization of continuing applications and the value of a patent are analyzed by using the number of citations, but basically, many of the patents for which a continuing application was utilized are considered to have high quality. The reason is, as was also mentioned in Section III, that inventions completed as a patent, for instance, by changing the scope of disclosure covered by the invention in line with the competitor's technology trend or even taking measures such as adding claims are considered to be important patents. In

addition, it is difficult to think that companies will spend extra money to complete a patent which originally has a low utility value.

## **2 Data**

We used the data from "EPO Patent Statistical Database, Aug., 2006 Edition" and "Pat6302f" (hereinafter referred to as NBER/Hall database) which is a database updated by Bronwyn Hall using "NBER U.S. Patent Citations Data File." The sample size used for the estimation without including the number of claims covers approximately 1.2 million registered patents from 1994 to 2002, and in the estimation formula in which the number of claims was included, the sample size covers approximately 570,000 registered patents from 1994 till 1998

## **3 Variables**

### **(1) Explained variables**

The explained variable is the number of forward citations created from the Patstat database.

### **(2) Explanatory variables**

As explanatory variables, we used variables which count the utilization frequency of continuing applications during the process of completion of a patent according to the continuation in part (CIP), the continuation application (CON) and the divisional application (DIV), respectively. Concurrently, in the same way, variables which count, according to the continuation in part (CIP), the continuation application (CON) and the divisional application (DIV), respectively, the number of subsidiary patents derived from the said patent as their parent patent by utilizing a continuing application are also treated as explanatory variables.

### **(3) Control variables**

The objective of this section is to analyze what kind of influence the utilization of continuing applications has on the quality of

a patent measured by means of the number of citations of that patent. However, the utilization of continuing applications is no more than a partial factor which has an influence on the quality of a patent, and therefore, in order to find out the effect arising from the utilization of continuing applications on the number of forward citations, it is necessary to concurrently include in the estimation formula other factors assumed to cause change in the quality of a patent. The number of backward citations, the number of citations of non-patent documents, the lag of backward citation, the number of claims, the number of inventors, the number of applicants, a dummy of year of filing, a dummy of year of registration and a dummy of technical field are used.

#### **4 Result of estimation**

The number of citations of a patent for which a continuation in part was utilized during the process of completion is significantly high. However, in cases where a continuation application or a divisional application was utilized, their effect on the number of citations was negatively significant. Consequently, if purely interpreted according to the past studies which analyzed patents by using citation information, this means that a patent for which a continuation in part was utilized during the process of completion has high value and that completed through a continuation application or a divisional application has low value. Also, the number of applications derived from that patent was estimated to be positively significant, regardless of whether it is a continuation in part, a continuation application or a divisional application. Therefore, this means that a patent from which other subsidiary applications were derived through a continuing application has high quality if judged from the significance measured by the number of citations.

However, as the applicant cannot add new matters in the case of a continuation

application or a divisional application, the description is basically identical in both the parent and subsidiary applications. Regarding a later application in which it is necessary to cite the invention of a certain application, either application can be cited, and in that case, the possibility of merely showing that a parent application alone was often cited can also be considered. However, this is a problem related only to the continuation application or the divisional application, and regarding the continuation in part, the result is significantly positive, regardless of whether it was utilized during the process of completion or at the time of creating a subsidiary application. This means that in both the former and the latter cases, the value is significantly higher than when a continuing application was not utilized.

Regarding other variables, the results of estimation were identical to the prior studies on the whole.

### **V Quality of essential patent and continuing applications**

In Section IV, we used the total U.S. patents as the object of analysis and mainly analyzed the relationship between continuing applications and the quality of a patent measured by the number of citations, and showed patents for which continuation in parts were utilized have high value. In this section, we will narrow down the object of analysis on the essential patents in the patent pools managed by MPEG LA LLC and make an analysis in units of patent.

#### **1 Purpose of analysis**

In this section two analyses will be made. One is to use these 290 essential patents as the sample and analyze the relationship between the utilization frequency of continuing applications and the number of citations. The other is to make the same estimation by using the parent application of an essential patent as the unit. Regarding the former analysis, basically the same as in

the analysis made in Section IV, the number of forward citations is used as an explained variable and the frequency of continuing applications as an explanatory variable. Regarding the latter, regardless of whether or not a patent granted by utilizing a continuing application is an essential patent, confirmation is made as to whether or not the frequency of continuing applications varies with the quality of the parent patent. We use the 290 essential patents in the patent pools managed by MPEG LA LLC as the object of analysis, and in the case where continuing applications were utilized during the process of completion, we designate a parent patent which was filed at the earliest point of time and count the number of subsidiary applications derived from there as a result of continuing applications according to each of the three types of continuing applications.

In the estimation by using the 290 essential patents as the sample, if the essential patents in the patent pools show the same tendency as the total U.S. patents, the hypotheses below might hold water.

**Hypothesis (1)** Patents for which a continuation in part was utilized during the process of completion have high quality and those for which a continuation application or a divisional application was utilized during the process of completion have low quality.

In the estimation by focusing our attention on the 189 parent applications of the essential patents, we have the concept as follows.

**Hypothesis (2)** From the patents with high quality judged from the significance measured by the number of forward citations, a large number of subsidiary applications were derived through continuing applications.

**Hypothesis (3)** R&D-specialized organizations cannot earn profits if they do not license, as they do not produce. Compared to other types of companies, they

have a higher incentive to make their own inventions an essential patent even by frequently employing continuing applications. Or, R&D-specialized organizations which pursue higher royalty revenue utilize continuing applications more frequently to expand their percentage within the pool.

## 2 Data

The citation information, the number of claims, the main IPC, the information of company groups, and the information of applicants' names were obtained from the Delphion database compiled by Thomson Scientific Inc. Compared to the Patstat, more recent information of forward citations can be obtained from it. The information of priority right and the data of continuing applications were extracted from the Patstat database.

## 3 Variables

### (1) Explained variables

In the estimation of hypothesis (1), the number of forward citations was used as an explained variable, the same as in Section IV. In the estimation of hypotheses (2) and (3), the number of subsidiary applications derived from the earliest parent patent through continuing applications was used as an explained variable.

### (2) Explanatory variables

In hypothesis (1), the number of continuing applications during the process of completion is used, and in hypotheses (2) and (3), the number of forward citations is used.

Also, in order to verify hypothesis (3), we use a company dummy.

### (3) Control variables

As for other variables, we use the same variables to verify the above hypotheses. Data such as the number of backward citations, the number of citations of non-patent documents, the number of claims, a dummy of year of filing, a dummy of year

of registration, and a company dummy are used.

#### 4 Result of estimation

The result of the estimation by using 290 essential patents as samples shows that, first, what is different from the result of Section IV where the total U.S. patents were used as the object of analysis is that the result of estimation formula (1) is significantly negative in the case where a continuation in part was utilized during the process of completion. In other words, an essential patent completed by using continuations in part after the filing of the parent patent to add new matters tends to have lower quality than if otherwise. In a similar way, the essential patents which were completed by utilizing continuation applications also show a significantly negative result, but this is not different from the trend seen in the total patents.

Next, in the result of the estimation by using as an explained variable the figure aggregating all continuing applications derived from the earliest parent patent for an essential patent, the coefficient of the number of forward citations was estimated to be significantly negative. In other words, the higher the quality of a patent is in terms of the significance measured by the number of forward citations, the less frequently a continuing application is utilized; or contrarily, a continuing application is more frequently utilized in the case where the quality of the earliest parent is low. The dummy of vertically integrated company is significant, and it is known that as the trend seen in all of the companies conducting both production and R&D, the utilization frequency of continuing applications is high.

According to the result obtained by narrowing down the explanatory variable only on the continuation in part and the continuation application, the coefficient of the number of forward citations is negative but is not statistically significant. The dummy of R&D organization and the dummy of vertically integrated company showed a

significantly positive result, thereby indicating that the utilization frequency of continuations in part and continuation applications is higher than in the case of the user type company which was set as a criterion. Furthermore, the coefficient of the dummy of R&D-specialized company is larger than that of the dummy of vertically integrated company. In other words, as far as the continuation in part and the continuing application alone are concerned, if other conditions are brought under control, then R&D-specialized organizations can be said to have a tendency to utilize most frequently.

It is difficult as to how this result should be interpreted, but it might be said that basically, the estimation by using the continuation in part and the continuation application yielded a result consistent with hypothesis (2). In other words, according to the theoretical analysis so far, it might be interpreted in this way: for instance, under the condition where there exists no side payment, R&D-specialized organizations for which there is no incentive to participate in the patent pool have strived to increase their own allocation among the royalty revenue of the patent pool by utilizing systems such as continuation in part and continuation application.

#### VI Conclusion

The main conclusions we reached are as follows. First, though as was also pointed out in the prior studies, we again confirmed that in contrast to the trend of the total U.S. patents, the utilization frequency of continuing applications was higher for technical standard-related essential patents. And, among the total U.S. patents, the value of a patent completed by utilizing continuation in part during the process of completion is higher in terms of the significance measured by the number of forward citations. And in contrast, among the essential patents in the patent pools managed by MPEG LA LLC, rather contrarily, it was made known statistically that the value of the patents based on the



same application method is significantly lower than that of the patents within the pools for which continuing applications were not utilized. Next, the analysis showed that among the standard-related applications, the utilization frequency of continuing applications also varies with the type of company. That is to say, vertically integrated companies which conduct both production and R&D and R&D-specialized organizations utilized continuation in part and continuing application relatively frequently, and further, R&D-specialized organizations tend to utilize more frequently than vertically integrated companies. The study by Nagaoka et al (2006) showed that according to the analysis in units of company, if among the essential patents held by a certain company, there is a high rate of patents for which continuing applications were utilized, then the average number of forward citations of the essential patents held by that company is lower. It was not yet made known whether there is a difference between individual companies, but we confirmed that this also varies with the type of company.

According to the result of the analysis in Section IV, on the whole, essential patents have high value, but at the same time, when a comparison is made by using the patents within the pools, those for which the system of continuing applications was frequently utilized have low quality. The patent pool is a system established with cooperation between companies in order to avoid the tragedy of the anticommons. If the result of this paper points to an intentional behavior, then that is a behavior which distorts the pool's allocation of royalty and may possibly hurt cooperation between companies. Like the DVD patent pool, there also exist cases where the pool splits up. However, we might say the ultimate problem lies in the fact that the value index of a patent acceptable to everyone has not yet been developed.

So far, it has been pointed out both theoretically and pragmatically that there is a low incentive for R&D-specialized organizations to participate in the pool. In reality, there exist R&D-specialized

organizations which participated in patent pools, and it has not necessarily been clearly explained why they participated. Though as one of the possible interpretations, we think that if based on the assumption that an organization participated in the standardization activity, the characteristics of the patent-filing behavior of an R&D-specialized organization made known in the analysis this time may point to a behavior intended to secure and increase royalty revenue because that organization cannot secure the position as an outsider. We want to examine this issue also with a theoretical approach in the future.