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Distribution of patent license fee in technology standard alliance: Dynamic process, Scheme and decision method

Shan-shan Wang*, Hong-qi Wang, Yue Li, Li Li

School of Management, Harbin University of Science and Technology, (P.R.CHINA)

E-mail: wssangel@sina.com

ABSTRACT

Distribution of patent license fee is the core content of intellectual property rights management in technology standard alliance, so a method for scientific and reasonable allocation of patent license fee is necessary which determines the long-term cooperation and sustainable development of alliance. In this paper, authors put forward the principles and dynamic process of patent license fee distribution in technology standard alliance by analyzing the patent license patterns and the royalty distribution characteristics of alliance. After that, the distribution scheme consists of both fixed part and variable part is proposed. Finally, the distribution coefficient determination method based on partner opinion integration is designed. The distribution process and scheme designed by authors fully considers the alliance's dynamic patent composition under technology standard as well as the final actual contribution of each partner. Simultaneously, the distribution coefficient determination method provided in this paper can effectively integrate all participant's opinions and has a dual function of encouragement and restriction for alliance partners, which may improve the efficiency of decision-making in alliance benefit allocation. This research may provide decision basis for technology standard alliance to allocate its patent license fee reasonably.

KEYWORDS

Technology standard alliance; Patent license; Distribution of patent license fee; Decision method; Partner opinion integration.



INTRODUCTION

Technology standard alliance is a coalition which is composed of multiple owners of technology or patent related to technology standard. With the purpose of establishing and popularizing technology standard, the partners in alliance share technology, develop technology standard together through patent technology integration and carry out patent license (Carl, 2001)^[1]. Technology standard alliance is helpful for promoting the exchanges of technical information or know-how that are not included in the patent, dispersing risks of research and development, and reducing the transaction cost of internal and external patent license (Clark, 2000)^[2], thus has become the main mode of global technology standardization in open innovation era. Nowadays, technology standard alliance is increasingly showing signs of cross-regional development of industrial alliance or standard working group with participation of many countries and multiagents, such as Wi-Fi Alliance, TD Alliance and IGRS Alliance.

The mission of technology standard alliance is to integrate the patents to form a technology standard, and to promote the widely license and exploitation of patents in technology standard. In this process, as the technology standard matures gradually, patent license has become a common phenomenon, therefore how to scientifically allocate license fee becomes a key issue in the course of alliance technology standardization.

Currently, the domestic and foreign studies related to alliance patent license fee distribution include the calculation method of patent license fee, the patent value evaluation and the alliance profit distribution. Zeng et al (2007) improved the price fixing mode in complex option and established a technology patent price fixing model in technology standard alliance^[3]. Watanabe (2005) and Xu et al (2007) made research on the calculation method of patent license fee with patent alliance and patent pool as the objects^[4,5]. A scientific evaluation on patent value can provide basis for alliance's patent license fee distribution. Cremers et al (2003) made analysis on the problem of assessing the patent value through public data, established a patent value assessment model and showed that the backward citations and the citations are positively related to the patent value^[6]. In the study of Ren et al (2007), the citations, the backward citations and the patent family size are regarded as the measure of the patent value^[7]. Also some scholars explored the methods on the distribution of interest in technology standard alliance, such as thinking that a member in alliance with more input, higher risk and greater patent value would have more earnings (Hua et al, 2006)^[8]. Besides, most studies applied the Shapley value method in alliance benefit distribution^[9,15].

There are a lot of researches on the alliance benefit distribution methods, but most of them pay attention to alliance partners' game and ignore the mutual constraint of both alliance manager and partners, simultaneously fail to fully integrate all partners' opinions. The current methods which make the benefit distribution procedure complex and difficult to operate also ignore the dynamic changes of patent structure in technology standard and have insufficient incentives in partners' patent development at the later stage, so there is need to set up a simple and practical method on distribution of patent license fee in technology standard alliance.

PATENT LICENSE PATTERNS AND ROYALTY DISTRIBUTION CHARACTERISTICS OF TECHNOLOGY STANDARD ALLIANCE

Patent license is an important approach of patent application and exploitation for technology standard alliance and there are various approaches in patent license. TABLE 1 lists the main patterns of patent license and the royalty distribution characteristics in technology standard alliance.

TABLE 1 : Patent license patterns and royalty distribution characteristics

License patterns			Royalty distribution	
Scope	Type	Content	License pricing	Distribution
Internal license	Independent license	A patentee independently licenses patents to other partners in alliance	Preferential price	Not involve
	Cross-license	Cross license patents between the patentees	Free or preferential price	Not involve
	Package license	License the packaging patents to alliance members, which may contain all standard patents or include part of the standard patents	Free or preferential price	Not involve when free or allocate according to the distribution scheme when charging
	Impermissibility	No permission	—	—
External license	Independent license	A patentee independently licenses patents (commonly non-essential patents in standard) to the licensees outside alliance	Normal price	Not involve
	Package license	License the packaging patents to the licensees outside alliance, which usually contain all standard patents or include part of the standard patents	Normal price	Allocate according to the distribution scheme
	Cross-license	Cross license patents between alliance (or alliance members) and the patentees outside alliance	Usually free	Generally not involve

What can be seen from TABLE 1 is that not all alliance members are involved in the patent license fee allocation, that is to say, only the patentees who contribute patents to the technology standard are qualified to participate in the royalty distribution, and the distribution issue only exists in the circumstances of internal and external patent package license. Among the patterns of patent license, the most important pattern which also ought to be strengthened in management for technology standard alliance is patent package license, and the activity of license fee distribution mainly exists in the process of internal and external patent package license. During patent package licensing, some patentees usually hand over their patents to one patentee in alliance or to the standard manager to carry out the unified licensing and royalty distribution^[16]. Moreover, in the whole process from the alliance formation to its operation, it is very common that the partners share the existing patents and continually develop new patents so as to form a perfect standard patent portfolio. Therefore, as the standard system mature, the patents contained within standard patent package will be more and more, which inevitably results in the dynamism of royalty distribution.

PRINCIPLES AND DYNAMIC PROCESS OF PATENT LICENSE FEE DISTRIBUTION IN TECHNOLOGY STANDARD ALLIANCE

Distribution principles of patent license fee in technology standard alliance

Reasonable distribution scheme for patent royalty can ensure the smooth operation of patent license activities in technology standard alliance, so the distribution of patent license fee should follow the principles below.

(1) Linking distribution scheme with partners’ patent values and actual contributions. The value of a partner’s existing patent can be cleared when signing the contract, while the partners will continue to develop new patents in the process of technology standardization, so it is necessary to determine the new patent value through later assessment. In the meantime, the actual contribution of each partner

during the development of new patents is also different, thus not only the values of existing patents but also those of subsequent new patents should be considered in the distribution scheme with the purpose that partners' future contributions can be given sufficient attention in the distribution process.

(2) Giving attention to the reasonable structure and dynamism of distribution scheme. According to the incomplete contract theory, the contract of technology standard alliance is not complete, that is the contract may not include all possible situations, so an ideal contract should achieve a balance of "beforehand and afterwards"^[17,18]. For this reason, license fee distribution scheme shall include fixed part and variable part with dynamic adjustment. In the formal contract that alliance partners signed, what can be ascertained are the fixed distribution coefficients. In virtue of the new inputs and patent outputs during the partners' cooperative innovation, the dynamic characteristics of patents which make up the technology standard should be given full consideration, and in order to stimulate the partners' enthusiasm and initiative, the weights of fixed and variable part as well as the variable distribution coefficients should be determined in future on the basis of not only the values of all patents included in standard but also the actual contributions of partners.

(3) Confirming distribution coefficients by fully integrating partners' opinions. The allocation scheme should be put forward by standard manager of alliance, but at the same time, the partners' opinions should also be taken into full account in accordance with the principle of fairness so that the distribution scheme can be accepted by all partners.

Dynamic distribution procedure of patent license fee in technology standard alliance

The distribution procedure of patent license fee in technology standard alliance is shown in Figure 1

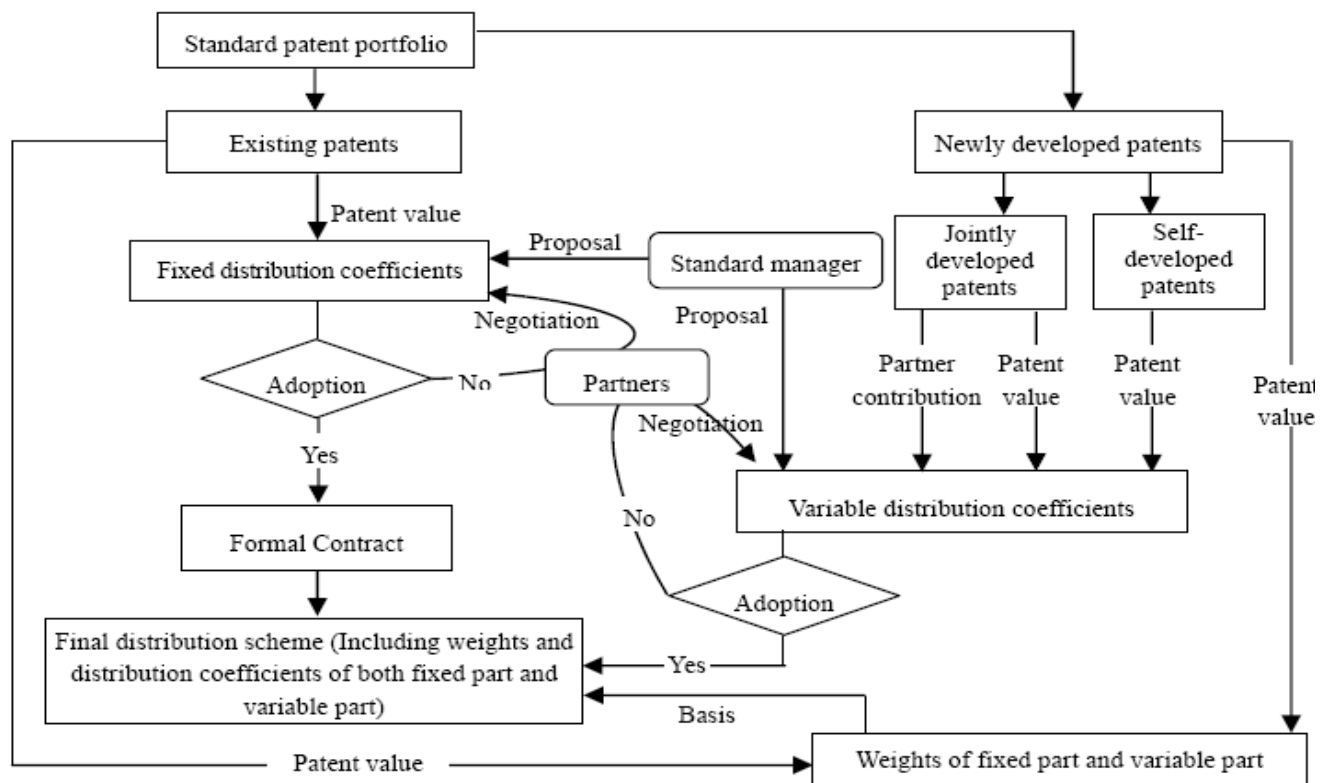


Figure 1 : The dynamic procedure of patent license fee distribution

A technology standard comes into being with patent portfolio support, therefore in the process of technology standard formation and upgrading, the patent structure of technology standard will change

which may include both the earlier patents and the newly developed patents. Hence, in the final distribution scheme of alliance patent license fee, the weights of fixed part and variable part as well as the distribution coefficients of the two parts shall be specified.

First, in the earlier stage, there is an agreement on coefficient of each partner in the fixed part of the contract, and only the patentees committing existing patents can share the benefits. According to each partner’s patent values, standard manager puts forward the initial fixed distribution coefficients, and then the formal coefficients of fixed distribution will be negotiated and confirmed after comments by partners.

Second, there is need to make sure the variable distribution coefficients of all partners in the later period and the distribution involves only the patentees who take part in the new patents development, similarly the initial variable distribution coefficients will be proposed by standard manager and then determined through partners’ negotiations. Newly developed patents consist of two parts, one is the jointly developed patents by partners, which means the variable distribution coefficients should take patent values and partners’ contributions for reference, the other is the self-developed patents by each partner, which means the variable distribution coefficients should consider patent value.

Finally, it is necessary to determine the weights of both fixed part and variable part in patent license fee, and the weights of fixed part and variable part can be made sure respectively based on the values of earlier existing patents and newly developed patents. The final agreed distribution scheme of patent license fee must be able to meet the patentees’ intentions and to achieve the benefit equilibrium of all partners.

THE DISTRIBUTION SCHEME OF PATENT LICENSE FEE

A partner in alliance may not only contribute existing patents but also develop new patents independently and jointly with other partners in the process of alliance development, and the new patents may be incorporated into standard patent package, therefore, a partner may ask for the earnings including both the fixed portion and the variable portion. If a partner contributes his existing patents without participating in the new patents development, he is only involved in the fixed part of the distribution. If a partner simply develops new patents, he can only take share in the variable part of the distribution. The scheme configuration of patent license fee distribution is as shown in TABLE 2.

TABLE 2 : The scheme configuration of patent license fee distribution

	The structure of distribution scheme	
	Fixed part	Variable part
Determination basis of weight	The ratio of existing patents’ values to all standard patents’ values	The ratio of newly developed patents’ values to all standard patents’ values
Determination way of weight	To be independently determined by alliance standard manager according to the values of existing and new patents	
Determination basis of a partner’s distribution coefficient	In relation to the existing patents that a partner contributes	In relation to the new patents that a partner develops
Determination way of a partner’s distribution coefficient	To be proposed by alliance standard manager and ascertained after joint consultation within all partners	

Assume that there are n partners in the alliance to participate in the fixed part distribution of patent license fee, and there are m partners to participate in the variable part distribution. If a member will simultaneously share the benefits of the two parts, then his fixed distribution coefficient is a_k ($k=1,2,\dots,n$) and variable distribution coefficient is b_i ($i=1,2,\dots,m$). Suppose R is the final patent license fee, then the return for this member is A_{ki} , as in (1).

$$A_{ki} = (\omega^f a_k + \omega^v b_i) \times R \quad (1)$$

The weight of fixed part is ω^f and the weight of variable part is ω^v ($\omega^f + \omega^v = 1$), they can be calculated according to patents' values, as in (2) and (3).

$$\omega^f = \frac{\text{Existing patents' values}}{\text{Existing patents' values} + \text{New patents' values}} \times 100\% \quad (2)$$

$$\omega^v = \frac{\text{New patents' values}}{\text{Existing patents' values} + \text{New patents' values}} \times 100\% \quad (3)$$

The weights and distribution coefficients of fixed and variable parts are all based on the patents' values, therefore, a scientific system of patent value assessment is crucial. At the same time, the determination of fixed and variable distribution coefficients ought to be a process of partners negotiating, so how to effectively integrate all partners' opinions and improve negotiation efficiency and effectiveness is another important issue in the distribution.

THE DECISION METHOD OF DISTRIBUTION COEFFICIENTS BASED ON INTEGRATION OF PARTNERS' OPINIONS

The process of ascertaining distribution coefficients is a comprehensive integration of partners' advices. The initial distribution coefficients are put forward by the alliance standard manager, on this basis, the partners' adjustment suggestions are allowed, then the partners' opinions are integrated and the optimum solution or satisfactory solution will be quickly achieved through optimizing search using relevant software^[19].

The general process of confirming the distribution coefficients based on integration of partners' opinions

The idea of using the method of partners' opinions integration to determine the distribution coefficients is as follows. Firstly, standard manager puts forward the initial distribution coefficients. Secondly, each partner gives the adjustment suggestion within a limited changing scope. Thirdly, standard manager sets the conditions about consistency, coordination and the reliability, and then model by integrating partners' opinions in a certain range of changes. Fourthly, a solution will be gotten by using computer. If there is an optimum solution, final distribution coefficients can be determined. If there is no optimum solution, the following three ways can be selected, one is to change the reliability condition in order to obtain the solution, another is to let partners give renewal adjustment advices and then repeat the following steps, the other is to readjust the initial distribution coefficients and repeat the following steps. Take fixed distribution coefficient for example, the procedure of ascertaining final distribution coefficients with integration of partners' opinions is as shown in Figure 2.

The advantages of this method are as listed below. First, because each partner will tend to present opinions which may be inclined to individual interests, the use of this method makes good constraints on partners so as to effectively avoid partner's artificiality and increase the solution speed. Second, it can restrict alliance standard manager to some extent because the unreasonable initial distribution coefficients proposed by manager will lead to big deviations when partners give advices so that a solution won't be achieved. In addition, alliance standard manager have a right to make appropriate adjustments on partners' opinions, but due to the limits to the variation range of partners'

opinions adjustment by the manager, the partners' opinions will be best reserved and the standard manager's subjective randomness can be avoided. Third, modeling and computer technology are used in this method to quickly get optimum or satisfactory solution, and thus shorten the invalid consultation process for a long time.

The decision method of distribution coefficients based on integration of partners' opinions

Still take fixed distribution coefficients for example, the decision method of all partners' distribution coefficients is as follows

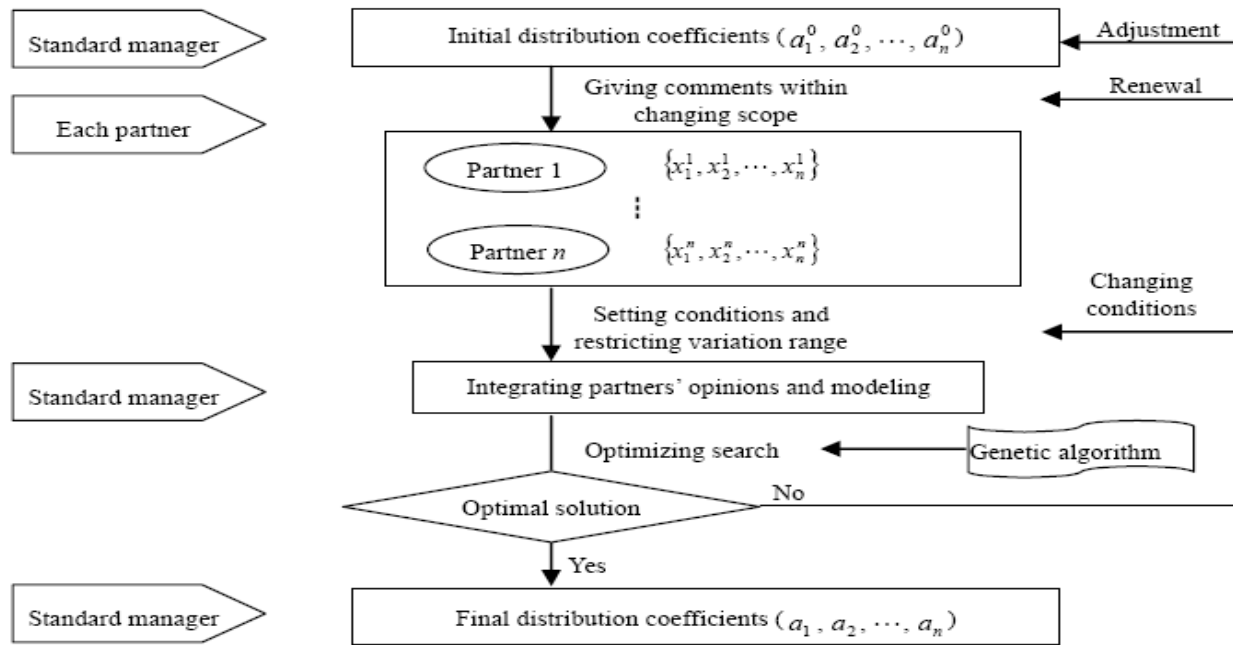


Figure 2 : The procedure of ascertaining final fixed distribution coefficients with integration of partners' opinions

(1) Putting forward the initial distribution coefficients. There are n partners to participate in the distribution of the fixed part of patent license fee, so the alliance standard manager provides a set of initial distribution coefficients named $a^0 = \{a_1^0, a_2^0, \dots, a_n^0\}$, where a_k^0 is the initial distribution coefficient of partner k ($k=1, 2, \dots, n$) and $\sum_{k=1}^n a_k^0 = 1$.

(2) Setting the fluctuation range of initial value and obtaining the adjustment value of partner k . For the initial distribution coefficient a_k^0 , its biggest variation range s_k ($s_k \geq 0$) is allowed and a^k is the adjusted value. For partner k , all partners will give the adjusted values, so the adjusted value of partner k is $a^k = \{a_1^k, a_2^k, \dots, a_n^k\}$, where $a_l^k = \{a_k^0, s_k\}$ indicates an adjusted value in a limited scope that partner l gives. The s_k means that each partner can make moderate adjustment on the given initial distribution coefficients aimed at partner k . If there is no limit to a partner's adjustment on the initial distribution coefficients, each partner will tend to his own benefits and it is hard to get a satisfactory solution.

(3) Setting the range of each partner's adjusted value and getting the best allocation set of partner k . For partner k , partner l gives the adjusted value a_l^k , let its allowable biggest change range be r_l ($r_l \geq 0$), then the allocation set of partner k can be expressed as $\{(a_1^k, r_1), (a_2^k, r_2), \dots, (a_n^k, r_n)\}$. The best allocation set of partner k will be $x^k = \{x_1^k, x_2^k, \dots, x_n^k\}$, where x_l^k is the final value adjusted according to the suggestion of partner l , which is determined by alliance standard manager. r_l lifts a restriction on the alliance standard manager's decision behaviors although the manager has the right to determine final distribution

coefficients, thus the partners' views can be well reserved and a group satisfied solution is easier to find^[19].

(4) Ascertaining the reliability, consistency, and coordination of all partners' opinions towards partner k . For partner k , the reliability, kurtosis, coefficient of variation and skewness can be used to separately reflect partner opinion's reliability, consistency, coordination of group value and the opinion's symmetry of weighted mean (See reference^[19] for detailed formulas).

(5) Modeling and calculating the best distribution coefficient value of partner k . In the model, the objective function is as (4).

$$\min f(x^k) = \sum_{l=1}^n |x_l^k - a_l^k| \quad (4)$$

The aim is to minimize the total adjustment amounts when searching partner's optimal adjustment scheme in a given scope. The constraints of the model include conformance requirements, coordination and reliability (See reference^[19] for detailed formulas).

An optimal solution can be calculated from the above model. If there is no optimum solution which means that there are tremendous differences of partners' opinions, it is necessary to reduce the reliability requirement, or adjust the variation range of initial values, or adjust the initial values. What should be pointed out is that genetic algorithm can be applied in optimization search^[19].

(6) Obtaining the distribution coefficient value of each partner and confirming the final distribution coefficients. Through the above calculation, the distribution coefficient values of all partners can be obtained and the set is $x = \{x^1, x^2, \dots, x^n\}$. Considering $\sum_{k=1}^n x^k \neq 1$, the final distribution coefficients

a_1, a_2, \dots, a_n can be achieved after conversion in order that $\sum_{k=1}^n a_k = 1$.

CONCLUSION

The distribution of patent license fee is an important management work in technology standard alliance with the complex and dynamic characteristics, so a scientific allocation of license fee is the premise and guarantee for orderly carrying out patent license activities and continuously promoting the technology standardization process. The prominence of this research is as follows. First, it divides patent license fee into two parts including fixed and variable by full consideration of the dynamism of alliance patent composition as well as the earlier inputs and later efforts of partners, and then designs the distribution procedure and scheme of patent license fee. Second, from the view of double restrictions of both standard manager and partners, a method for determining distribution coefficients based on integration of partners' opinions is proposed. This research may provide decision support for technology standard alliance to scientifically allocate the patent license fee.

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