

The Research on National Defense Patent Values Evaluation

Xinghua Lu and Zhixin Ma

Abstract—National defense patent refer to invention patents that involve national defense interests and have a potential role in national defense construction and require confidentiality. They are a special patent division in Chinese patents. This article expounds the characteristics of national defense patents, the purpose of national defense patent value evaluation, and the classification of national defense patent value. Based on the characteristics of national defense patents, this article proposes a national defense patent value evaluation model, which can quickly and quickly evaluate the value of national defense patents.

Index Terms—National defense patent, values evaluation.

I. CHARACTERISTICS OF NATIONAL DEFENSE PATENTS

National defense patent is a kind of patent. In China, national defense patents refer to invention patents which involve national defense interests and have potential role on national defense construction and need to be kept secret. They are mainly from research institutes, universities, enterprises and other units related to military and military. The difference between national defense patents and general patents is: First, there are different types. General patents include three types of inventions, utility models, and appearance design, national defense patents have only one type of invention patent. Second, the acceptance mechanism and the acceptance conditions are different. The patent application for national defense shall be accepted by the National Defense Patent Office. The subject matter must be an invention or creation that has a potential role in national defense or has a potential effect on national defense construction, and its content is confidential. The subject of a general patent application generally does not involve national defense interests, and is accepted by the Patent Office of the State Intellectual Property Office [1]. Third, the criteria for judging novelty are different. National defense patents require more stringent and higher standards than general patents for novelty. Fourth, the distribution of ownership and benefits is different. Most national defense patents are invested by the state and are produced in defense research and production. In determining the distribution of their rights and interests, it is necessary to first consider the national security factor, and secondly to consider the interests of individuals and units. General patents can usually be invested by individuals or by units or others. The distribution of ownership interests is determined by the inventor and the investor. Fifth, market access requirements

are different. Because it involves national defense interests, the rights holders cannot independently transfer and implement national defense patents in accordance with the laws of the market. Usually, it must be exercised within the scope authorized and designated by the state. It needs to be managed and supervised by the government and the military, and it shows the characteristics of incomplete competition in market access. Ordinary patents are fully oriented to domestic and international markets and can be traded with any person or entity in accordance with market trading principles. Sixth, the degree of disclosure of rights is different. Ordinary patents are completely open to the public, and the content of national defense patents is classified as secret or confidential, and they are subject to confidentiality laws and relevant state secrecy regulations, it is only known to a specific range of personnel for a certain period of time, and its confidentiality is lost only after it is declassified and gradually civilian. Seventh, the provisions on patent agency are different. To apply for a national defense patent, it is necessary to entrust a patent entrusting agency, that is, a national defense patent agency appointed by the National Defense Patent Office and approved by the State Intellectual Property Office. Other patent agencies have no right to act as agents, and the general patent application agency does not have such a restriction. Eighth, the regulations on fees are different. National defense patent applications are not subject to maintenance fees, and general invention patent applications are subject to application maintenance fees from the third year onwards. The defense patentee can obtain the national defense patent compensation fee, the amount is determined by the National Defense Patent Office, and the ordinary invention patentee cannot obtain compensation [2].

II. THE PURPOSE AND SIGNIFICANCE OF THE EVALUATION OF NATIONAL DEFENSE PATENT VALUE

Patent is an important part of intellectual property, a knowledge product and a special intangible asset. In a general sense, the evaluation of patent value is an assessment of the market value of a patent in a manner similar to the evaluation of any tangible or intangible asset, focusing on the future economic benefits of the patented intellectual property right, to promote the development and effective use of patented knowledge products. National defense patents, like ordinary patents, have market economic value. What is different is that they play a special and potential role in promoting, supporting and maintaining national security and advanced national defense technology. Therefore, in addition to having a clear economic purpose, it is more important to make a comprehensive assessment of the value of national defense

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Xinghua Lu and Zhixin Ma are with the Army Engineering University, China (e-mail: 907229834@qq.com).

patents in terms of intellectual property management, such as military application, technical value, confidential value, and social use value. By quantifying the value level of its knowledge products, it provides a basis for the effective use and scientific management of national defense patents. From the realistic situation, the significance of national defense patent value assessment is mainly reflected in three aspects [3].

A. It Is Conducive to Enhancing and Demonstrating the Core Competitiveness of Military Enterprises

The products of military industrial enterprises are mainly weapons and equipment. In the fierce competition in the military industrial market, the competitiveness of enterprises is not only reflected in the possession of powerful capital assets and materialized assets. More importantly, it is necessary to have more high-tech military products and more high-value patented technologies needed in the future military market. In particular, with the increase in market activities such as the export of weapons and equipment and the transfer of product production rights, as well as the possible mergers and reorganizations between military enterprises, we must all face the problem of assessing the value of intellectual property rights. Who has more high-value national defense patent products, whoever has more intellectual capital and stronger core competitiveness.

B. It Is Conducive to Strengthening the Management of State-Owned Assets

The National Defense patent is a knowledge achievement obtained by the state through investment of funds, and it is an important knowledge asset with special significance. By assessing the value of patents, we can not only strengthen the management of patent knowledge, but also effectively raise people's attention to "high-value knowledge assets", to prevent the improper loss of high value knowledge assets and provide a basis for the all-round management of national knowledge assets.

C. It Is Conducive to Formulating Effective Classification Management Strategies Based on Patent Value

The confidentiality of national defense patents and the relative proprietary characteristics of the application field not only play an effective role in the protection of national defense intellectual property rights, but also have certain restrictions on the timing of patents and the transformation and promotion of results. Scientific evaluation of the value of national defense patents can not only effectively protect intellectual property rights of high-value and high-quality patents, scientifically determine the decryption period of national defense patents, prevent the risk of patent compromise, and timely remove those "sleep" patents whose value has expired. It is also beneficial to declassify some patents in time according to the military demand value of patents, market economic value, and technology alternative value, to commercialize patents with market-oriented mechanism, and to promote the effective implementation of national defense patents in military and civilian fields.

III. CLASSIFICATION OF NATIONAL DEFENSE PATENT VALUE

The value of patents is the positive meaning and usefulness of patents for rights subjects. In essence, the patent value is embodied in the fact that the exclusive implementation of patented technology makes the subject of the right obtain excess profits, that is, the use value of patented technology. However, as the use of patents has deepened, patent behavior has become complex and diverse, the subject of rights has diversified the value orientation of patents, some for self-implementation, some for direct gains through transactions, some for strategic value, some for personal spiritual satisfaction, and so on.

Under normal circumstances, the value of patents can first be divided into economic value and non-economic value. The economic value of a patent is what people usually think of, and it refers to the economic benefits that a patent brings to a right subject. The majority of patents owned or used by the subject of rights are for the purpose of obtaining economic benefits directly or indirectly, especially for enterprises. Because the essence of the patent system is to grant the right holder a certain monopoly power to ensure its sufficient economic return, and thus encourage invention and creation. However, in the unique environment of our country, there are still a large number of individuals or units that are motivated by the non-economic value of patents, such as to meet personal achievement, to evaluate titles, to complete task indicators, to simply win awards, and so on. This non-economic value usually does not require assessment and varies from individual needs.

The economic value of patents can be divided into direct economic value and indirect economic value. The direct economic value of a patent refers to the economic benefits directly obtained by the right subject through the use of the patent, such as the economic benefits directly obtained through self-implementation, licensing, transfer, pledge, litigation, etc. This is the main way to realize the value of patents. However, with the deepening and promotion of the patent strategy, rights subjects often use patents to achieve many strategic objectives, such as building technical barriers, hindering the development of rivals, increasing bargaining chips, preventing patent infringement, showing their own strength, attracting foreign investment, and winning user satisfaction. Increase the number of sales, etc., thereby increasing the competitive advantage of rights subjects in the market, and gaining economic benefits from them. This is the indirect economic value of a patent, which can also be called strategic value. Strategic values are embedded within the subject of rights and are usually not subject to assessment. However, the subject of rights is sometimes blinded by strategic values and accumulates patents so much that maintenance costs are too high and become a burden. Therefore, the author believes that although the patent based on strategic value orientation does not need to make value evaluation, it is necessary to make quality evaluation to facilitate the management of the hierarchy. When the strategic value of the patent to the subject of rights is not large and it is at the end of the patent quality level, it can consider transferring or giving up [4].

The direct economic value of patents is the value realization method pursued by many patent holders, especially enterprises, it can usually be measured by currency, and it is also the main object of patent value evaluation. According to the different roles of patents, the direct economic value of patents can be divided into use value, transaction value, liquidation value, guarantee value and fair value. The so-called use value refers to the value that patented technology can be used in industrial production. The value of use is the fundamental value of the patent. As Hitachi's famous saying: As long as the company uses the patented technology, the patent has value; the greatest value of the patent will occur when "the competitors or other users have no choice and must use the patented technology." When others must use the patent, the patent has a tradable premise. The so-called patent transaction value refers to the price of the patent in the trading market, which can also be called the market value, and it usually represents the economic benefits arising from the transaction of patent licensing, transfer, capital contribution, merger and acquisition. Patent market value is regarded as the highest and most stable value. Before implementing the patent transaction, the value of the patent should be evaluated. But at what price the final patent is sold is the result of the game between the two parties. Therefore, some people think that "for the value of intellectual property, there may be only subjective facts, but there may not be any objective facts." However, no matter how the negotiation behavior affects or changes the market value of the patent, the intrinsic value of the patent itself plays a role that cannot be ignored. The so-called liquidation value of a patent refers to the value of an asset that is judged on the basis of forced sale, rapid liquidation or other abnormal market conditions. The liquidation value is the relatively determined minimum price, usually in the case of corporate bankruptcy liquidation. The so-called guarantee value of a patent refers to the value of a patent as a property right as a guarantee of the performance of a secured debt. The right subject uses his patent as pledge object to loan to the bank, that is, to realize the guarantee value of the patent. The so-called fair value of patents refers to the basic amount of compensation that the court should award the infringer based on the principle of fairness when the patent right is infringed, excluding the part of punitive damages. With the rapid growth of patent infringement cases, how to calculate the amount of compensation for infringement has become a very difficult problem in judicial trials. The key lies in the evaluation of patent value.

From the above discussion, we can see that the value classification of patents is different from different angles. That is to say, the purpose of patent generation is different, and the value orientation of patents is different. We believe that for defense patents, their value can be divided into the following five categories [5].

(1) Military value. This refers to the effectiveness and role of national defense patents in the field of national defense and military affairs. It can be summarized as a unique "military-specific value".

(2) Technical value. This is the embodiment of the technical content and characteristics of national defense patents, is also a necessary condition for patents to call them

patents, is the fundamental place for the survival and survival of patents, can be summarized as "useful value".

(3) Economic value. This is directly generated by patent licensing and transfer, and can be summarized as "asset value".

(4) Legal value. This is to protect the independent innovation achievements of the invention subject in the form of patent rights. At the same time, it has a deterrent effect on competitors by possessing a certain number of authorized patents, which can be summarized as "defensive value".

(5) Social value. This is a positive driving role and influence on the development of society through patent implementation, military-to-civilian and other means, which can be summarized as "promoting value" or "impact value" [6].

IV. EVALUATION MODEL OF NATIONAL DEFENSE PATENT VALUE

According to the classification of national defense patent value, we propose a national defense patent value evaluation model as:

$$V = \sum_{i=1}^o wm_i M_i + \sum_{j=1}^p wt_j T_j + \sum_{k=1}^q we_k E_k + \sum_{m=1}^r wl_m L_m + \sum_{n=1}^s ws_n S_n$$

Among them, V is the final score of national defense patent value evaluation; wm_i and M_i are respectively the weights and scores of the i index in the military value evaluation dimension, $i=1, \dots, o$; wt_j and T_j are respectively the weights and scores of the j index in the technical value evaluation dimension, $j=1, \dots, p$; we_k and E_k are respectively the weights and scores of the k index in the economic value evaluation dimension, $k=1, \dots, q$; wl_m and L_m are respectively the weights and scores of the m index in the legal value evaluation dimension, $m=1, \dots, r$; ws_n and S_n are respectively the weights and scores of the n index in the social value evaluation dimension, $n=1, \dots, s$; and o, p, q, r, s are respectively the number of indicators under the military, technical, economic, legal, and social values dimensions. They values in this article are respectively 4, 5, 4, 4, 2. The weighting coefficients of each indicator are shown in Table I.

It should be noted that the weights of the indicators in Table I are only those given by the author on the basis of relevant experience and can be used to adjust the weights of the indicators based on the actual situation of the object to be assessed.

TABLE I: THE NATIONAL DEFENSE PATENT VALUE EVALUATION INDEX SYSTEM AND THE WEIGHT COEFFICIENT OF EACH INDEX IN EVALUATION MODEL

First level evaluation index	Second level evaluation index	Weight coefficient	Total weight
Military value	Urgency of military demand	0.1	0.4
	Level of importance in the field of military applications	0.1	

	Military application easy to achieving	0.1	
	Matching with existing military operational systems	0.1	
Technical value	Progressiveness of technological innovation	0.1	0.3
	Technology substitutability	0.05	
	Key to the technical field	0.05	
	Level of technical standardization	0.05	
	Technology development trend	0.05	
Economic Value	Market demand	0.05	0.2
	Industrialization prospect	0.05	
	Market trend	0.05	
	Market application scope	0.05	
Legal value	Authorized independent right protection scope	0.01	0.05
	Authorized rights protection level	0.01	
	Subject of authorization claim	0.01	
	Patent remaining protection time	0.02	
	Influence on improving national defense science and technology level	0.025	
social value	Impact on increasing national pride among the population	0.025	0.05

V. THE MEANING AND SCORING OF EACH EVALUATION INDEX IN THE MODEL

A. Military Value

Military value is the value of military application, it is a unique evaluation index of national defense patents, and it is also the most critical evaluation index. If the national defense patent lacks the value of military application, its comprehensive value will be greatly reduced. The military value evaluation index system includes the following four indicators, each of which has a perfect score of 100 points.

(1)The urgency of military demand. It is mainly used to evaluate whether the invention patent belongs to the technology that is urgently needed to enhance the combat capability of the troops and enhance the advanced nature of the military combat system. The patented technology that is urgently needed is 81-100 points, the urgency is generally 50-80 points, and the unwarranted is 0-49 points.

(2) Level of importance in the field of military applications. According to the actual needs of military competition, it is mainly to evaluate whether the application scope of invention patents belongs to important or key areas of national defense and military technology, For example, in the fields of military aerospace, air defense and anti-missile, and information warfare, the competition of military technology is extremely fierce, the patent application field is important for 81-100 points, which is 50-80 points for general and 0-49 points for unimportant ones.

(3) Military application easy to achieving. It is mainly evaluated whether the application of invention patents in the military field requires special basic conditions and support measures, whether these basic conditions and support measures are easy to implement, it is easy to achieve 81-100

points, 60-80 points are more likely to achieve the relevant conditions, and 0-40 points are unlikely.

(4) Matching with existing military operational systems. It mainly evaluates whether the application of invention patents conflicts with existing technologies in existing military combat systems. If the match is good, it is 100 points. If the match is general and does not have a significant negative impact, it is 50-80 points. If there is a technical conflict, it is 0 points.

B. Technical Value

The technical value is the premise that the invention application is granted the patent right, and also the basis for the patent implementation transformation. The evaluation index system of patent technology value includes the following four indicators, each of which has a perfect score of 100 points.

(1) Progressiveness of technological innovation. The technological innovativeness of invention patents is judged by whether the technological problems solved by invention are particularly difficult or important, whether the technological effects obtained are particularly significant, how much improvement has been made in the technological scheme itself with respect to the existing technology, and whether the invention patents can be implemented only by relying on other technologies, so as to assess the degree of innovation of the patent. The more difficult it is to solve the technical problems of invention patents, the more significant the technical effects obtained, and the higher the score. The technical innovation is very significant, the score is 81-100, with a certain degree of innovation, the score is 60-80, the technical innovation is general, the score is 0~59.

(2) Technology substitutability. From the technical point of view, it is judged whether the invention patent can be replaced by other technical means, and whether the invention is easy to achieve the original technical effect after the invention point is deleted, thereby evaluating the substitutability and difficulty level of the invention patent. If the technical solution is difficult to be replaced by other technical means, the score is 100 points; if it can be achieved and replaced by other means, the score is 50 points; if it is easily replaced by other means, the score is 0.

(3) Key to the technical field. According to the status and role of relevant technical fields in military competition and related industries in military economic activities, we can judge whether they are important or not, involving particularly active, core, cutting-edge, technical and economic lifelines, pillar industries or technical fields of great significance to national defense, military and national economy, or in national defense and military affairs. Activities occupy an important position in national defense, military and economic development has a major role in the important areas of technology, so as to assess whether the important direction of national defense and military activities in line with the development. Those involved in significant technical fields scored 61 to 100 points; those involved in important technical fields that have a greater role have scored 41 to 60 points; it is a general technical field and scores 0 to 40 points.

(4) Level of technical standardization. The standardization

level of technology is judged according to whether the technical scheme has been written into the standard or will be written into the standard in the future, whether the technical scheme involves the standard but is uncertain whether it can be written into the standard, whether the technical scheme has not been written into the standard and will not be written into the standard or not in the future. If it has been written or will be written into the national standard or the national military standard in the future, it will be 81~100 points; if it involves the standard but it is not sure whether it can be written into the standard, it will get 51-80 points; otherwise it will be 0-49.

(5) Technology development trend. According to the current development direction of related technologies, it is judged that it is an emerging technology that develops rapidly and vigorously, mature technology that is steadily and continuously developed, or a phase-out technology that lacks development momentum in the later stage, so as to evaluate the current development stage and development trend of the technology. Emerging technologies, 61 to 100 points; mature technology, get 1 to 60 points; eliminate technology, do not score.

C. Economic Value

Economic value, also known as market value, is one of the important considerations for the evaluation of patent value. However, the success of the market is also related to many factors other than patents, especially in the face of fierce military competition. Sometimes economic value is often less important than the combined power of military value and technical value. The evaluation index system of patent technology value includes the following four indicators, each of which has a perfect score of 100 points.

(1) Market demand. Judging and evaluating the market expectation and demand for technology and the market demand for patent operation activities according to the demand degree of the corresponding technology or product in the market, the density of patent applications in the corresponding field, and the significance of patent operation activities in the corresponding field. The higher the market demand is, the higher the score is; the lower the contrary, the score is 0-100.

(2) Industrialization prospect. According to whether the technical solution has been industrialized, the difficulty or cost of product conversion in the field, whether there is better or similar product in the market, whether the applicant has industrial strength, whether there is a monopoly or dominant competitor to judge the technology Whether the solution can be applied to the industry to convert into products or services, and the difficulty of conversion, to assess the feasibility of technology into products and market. The better the industrialization prospect, the higher the score; the lower the contrary, the score is 0-100.

(3) Market trend. According to the industry's expectations of future market space, whether the technology is associated with products that meet market needs, whether the technology is associated with products that are gradually withdrawing from the market, whether the technology route is in an advantageous or weak position in competition with similar technologies, etc., to evaluate the driving degree of the technology to the market and judge the market trend of the

technology after entering the industry. The better the market trend, the higher the score; the lower the contrary, the score is 0-100.

(4) Market application scope. Assess the status and scope of use of the technology solution in the market according to whether the technology is general-purpose technology, whether it is specific technology, the target and scale of consumption of the technology-related products, the current market share of the related products, sales scale, etc., the score is 0-100.

D. Legal Value

The legal value of a patent is reflected in the writing of the claim, the layout of the application, the remaining protection time, etc. The evaluation index system of patent legal value includes the following four indicators, each of which has a perfect score of 100 points.

(1) Authorized independent right protection scope. According to the independent claim of the authorization text, the subject name, the number of technical features, the appropriate generalization, the functional definition, the numerical range, the non-essential technical features, the parallel technical solution to determine the scope of protection, the scope of protection of the independent claim determines the size of the patent. The greater the scope of protection of the independent claims, the higher the score, corresponding to 0-100 points according to the judgment of the size of the range.

(2) Authorized rights protection level. From the perspective of the total number of authorized claims, the number of independent claims, the nested relationship of each claim, the expansion of content, and the connection, it is assessed whether the claims are clearly structured, the system is complete, whether they are fully excavated, and whether they form a comprehensive protection of multiple perspectives. The stronger the claim, the higher the score, the score is 0-100.

(3) Subject of authorization claim. According to the number of implementers contained in the independent claims of the authorized text, the degree of difficulty in determining infringement is assessed; if a product has all the structure and functions or if a subject implements all the steps, it belongs to the "unilateral subject", if it is implemented by more than two subjects, such as a system composed of multiple devices, and more. The implementation of the steps by the main body belongs to the "multi-party main body". The implementation of a unilateral entity is usually easier to determine a clear violation than the implementation of a multi-party entity. The subject of the claim is a unilateral subject with 51 to 100 points; the other 0 to 50 points.

(4) Patent remaining protection time. Obviously, the longer the remaining protection time, the higher the score, and vice versa, the score is 0-100.

E. Social Value

The social value of national defense patents refers to the positive role and influence on social development and progress through the implementation of patents and the transfer of military to civilian. The evaluation index system of patent legal social value includes the following two indicators,

each of which has a perfect score of 100 points.

(1) Influence on improving national defense science and technology level. This indicator mainly assesses whether the patented technology can have an important impact on improving the national defense technology level after the implementation of the patent. If the impact is obvious, the score is 81-100. If the effect is average, the score is 60-80. If there is no obvious influence, the score is 0-50.

(2) Impact on increasing national pride among the population. This indicator mainly assesses whether the patented technology can generate national pride among the general public after the implementation of the patent. If the impact is obvious, the score is 81-100. If the effect is average, the score is 60-80. If there is no obvious influence, the score is 0-50.

VI. SUMMARY

National defense patents refer to invention patents that involve national defense interests and have a potential role in national defense construction and require confidentiality. They are a special patent division in Chinese patents. This paper expounds the characteristics of national defense patents, the purpose of national defense patent value evaluation, and the classification of national defense patent value. Based on the characteristics of national defense patents, this paper proposes a national defense patent value evaluation model, which can quickly and quickly evaluate the value of national defense patents. The evaluation is beneficial to the defense patent administrators to identify high-value core patents, which is beneficial for market participants to adopt more targeted strategies in patent operation activities. In addition, in the actual evaluation work, the indicators can be added or deleted according to the actual situation of the subject to which the object is evaluated and the development stage, and the weight of each indicator can be adjusted to evaluate the

patent value more objectively and comprehensively.

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Lu Xinghua was born in Shijiazhuang, Hebei, China in 1961. He received a Ph.D. in control theory and control engineering from Beijing University of Science and Technology in 2005.

He is now a full professor of Army Engineering University-Shijiazhuang Campus, mainly engaged in Weapons and equipment management.

Prof. Lu is a member of the Decision Science Committee of the Chinese Society of Systems.



Ma Zhixin was born in Shijiazhuang, Hebei, China in 1988. He is a master student of Army Engineering University-Shijiazhuang Campus. His profession is management science and engineering, mainly engaged in weapons and equipment management.