

Cultivation and Operation of High-value Patents from the Perspective of Intelligent Manufacturing

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Abstract

In recent years, intelligent manufacturing has become a key area and key mode of social and economic development, and the development of intelligent manufacturing has entered the stage of in-depth implementation from macro planning. China and other major manufacturing powers have issued a series of policies to support the intelligent transformation of the manufacturing industry. The all-round development of intelligent manufacturing has become the most core task in the era of "Industry 4.0". This article starts with the strategy of intelligent manufacturing operation at home and abroad, takes the cultivation and evaluation scheme of High-value patents as the hub, connects intelligent manufacturing and patent operations, and get a generalizable paradigm for High-value patent operation in the field of intelligent manufacturing.

Keywords

Intelligent Manufacturing; High-value Patents; Cultivation; Operation.

1. Introduction

Intelligent manufacturing is the technical core of the Fourth Industrial Revolution and the commanding height of competition among countries in the world. Based on the new generation of information technology, it is oriented to the whole life cycle of products and runs through all aspects of manufacturing activities such as design, production, management and service. It is a general term for advanced manufacturing processes, systems and modes with functions such as deep self-perception of information, intelligent optimization and self-decision-precision control and self-execution. Its core is manufacturing, the essence is advanced manufacturing, the foundation is digitization, the trend is artificial intelligence, and the carrier is intelligent equipment and software, which is characterized by integrating intelligence throughout the production process, and it has a high degree of flexibility and integration.

Intelligent manufacturing industry is a deep integration of the new generation of information technology and manufacturing industry, and patent ability determines the core competitiveness of the development of intelligent manufacturing industry and plays a supporting and leading role in the intelligent development of manufacturing industry. Excavating High-value patents with the field of intelligent manufacturing products and equipment as the core is the need for the high-quality development of China's intelligent manufacturing industry economy and science and technology. It is also the need for China to further implement the innovation-driven development strategy and accelerate the construction of an innovative country. It is also the need to build a strong intellectual property country.

2. Overview of Strategic Measures for Intelligent Manufacturing at Home and Abroad

Since 2008, developed countries have put forward the strategy of "Re-industrialization", taking intelligent manufacturing as the development direction of the future manufacturing industry, and formulating policies to provide financial support to improve the competitiveness of the national manufacturing industry and seize the commanding heights of the manufacturing industry. From the perspective of development pattern, traditional manufacturing powers in Europe and the United States have more technology and experience accumulation, less difficulty in transformation and upgrading, and strong competitive strength. Based on the accumulation of the world factory era, Asia and other emerging economies have also shown great competitive advantages in intelligent manufacturing. After the rapid development of reform and opening up, China has also become a major manufacturing country with great influence in the world.

2.1. U.S Intelligent Manufacturing Development Strategy

Since the 21st century, in order to accelerate the pace of manufacturing return, the United States has successively carried out "Re-industrialization Strategy" and "Industrial Internet Strategy", hoping to lead the future development of the world manufacturing industry again through intelligent manufacturing.

The U.S. Re-industrialization strategy mainly includes the following: First, build a technological innovation system that combines industry, university and research. Deeply integrate the federal government, enterprises and universities to promote technological innovation, and promote the research and development of emerging technologies such as investment information, biology and nanotechnology in the government, enterprises and universities to promote national industrial innovation and development. Second, pay attention to the student education system. Implement educational and training programs to help community colleges, focus on student skills and technical training, and expand the professional and technical workers required by industries such as health care, transportation, and advanced manufacturing, transportation and advanced manufacturing. Third, encourage enterprises to innovate and increase employment opportunities. Release a corporate tax reform plan to increase tax cuts, encourage greater domestic investment in the United States to increase employment opportunities, and promote the development of American manufacturing.

The industrial Internet strategy is based on the development of manufacturing as the core task of national economic construction. Promote the industrial network mode of interconnection with people, data and intelligent machines, effectively integrate the industrial revolution with the Internet, promote the application of new generation of information technologies such as the Internet of Things, cloud computing and big data to the manufacturing field, and change the previous manufacturing production process. The integration of industrial Internet and manufacturing brings a new model to the manufacturing industry. First, intelligent production, intelligent decision-making and dynamic optimization and efficient transformation from a single machine to the whole factory to accelerate production efficiency, improve product quality and reduce production costs; second, networked collaboration, cultivate new models such as crowd-sourcing and crowd-creation, collaborative design and manufacturing, vertical e-commerce to reduce the cost of new product research and development; third, service transformation, pay attention to the real-time monitoring of product operation, and provide remote maintenance and fault prediction services.

2.2. Germany's Intelligent Manufacturing Development Strategy

In order to ensure that the German government maintains its leading position in global manufacturing through intelligent creation and technological innovation, it has launched three

important strategies, "2006 High-tech Strategy", "2020 High-tech Strategy" and "Industry 4.0 Strategy", which clarify the government's policy recommendations for reshaping the manufacturing industry and stimulate local innovation. Strengthen the brand, technology and competitive advantages of German manufacturing. The following mainly introduces the "2020 High-tech Strategy" and "Industry 4.0 Strategy".

In July 2010, the German government promulgated the "2020 High-tech Strategy", focusing on five major technical fields, promoting knowledge innovation and the commercial application of scientific research achievements, and initially forming a situation of leading the world's scientific and technological innovation and maintaining the advantages of German manufacturing high-end brands. First, in the field of climate/energy technology, improve the predictability of the impact of climate change on human life. Second, in the field of health care/nutrition technology, we will promote small and medium-sized enterprises to carry out preventive measures and health management. Third, in the field of transportation technology, support the development of high-quality and low-carbon technologies. Fourth, in the field of safety technology, establish a rapid mitigation mechanism for natural environmental disasters and large-scale epidemics. Fifth, in the field of communication technology, focus on cultivating a platform for population flow and information needs in modern society that adapts to globalization.

In 2013, Germany promulgated "Safeguarding the Future of German Manufacturing: Recommendations on Implementing the "Industry 4.0 Strategy"" to establish a new intelligent production model and industrial structure based on mechanization, automation and informatization. The specific measures mainly have four directions: first, change the manufacturing production process through physical information systems, apply the Internet of Things to the manufacturing industry, promote the high integration of enterprise production process links and information physics systems, and strengthen the transformation of informatization and intelligence; second, form horizontal collections and Vertical collection to realize the whole process of intelligent manufacturing production; third, give full play to the role of human resources with high quality, and cultivate new business opportunities and models; fourth, form a new intelligent manufacturing working mode to improve the safety of manufacturing equipment and manufacturing products.

2.3. Japan's Intelligent Manufacturing Development Strategy

Facing the new industrial revolution and the development of intelligent manufacturing, Japan gives full play to its existing advantages in automated production and robot manufacturing. Its response mainly starts with three major strategies, namely, the new robot strategy, the vision of "Super Intelligent Society" and the "Interconnected Industry" initiative. The following is mainly an analysis of the new robot strategy.

On January 23, 2015, the Japanese government released a report called "New Robot Strategy". The strategy positions all systems that use digital and network technology, as well as advanced sensors and artificial intelligence, as new concepts of "robots." The Strategy points out that there are three main core strategies to realize the robot revolution: first, improve Japan's robot creation and cultivation ability at the root, so that Japan can become a world robot innovation base; second, promote the use of robots in different fields according to the development goals of each part to achieve Japan's "normalization of robots". Third, Promote the realization of technical standardization and widespread dissemination of robots on a global scale.

Next, the strategy puts forward a "five-year action plan" for robots, which includes two aspects: first, cross-cutting issues, including: establishing an incentive mechanism for the robot revolution; the development trend of the next generation of technology; standard policies for robot internationalization; robot field detection; human resources development; and the reform of robot supervision mechanism. Expansion of robot rewards; robot Olympic

competition. The second is the implementation of specific industries, which puts forward key areas and 2020 goals for specific industries. These industries include manufacturing; services; medical and nursing; infrastructure, disaster response and construction; agriculture, forestry, fisheries and food industries. For manufacturing, its key areas include promoting robots to engage in labor-intensive work such as component processing and assembly, food processing, developing complex robots that can use IT, and establishing modular and streamlined robot operation systems.

2.4. China's Intelligent Manufacturing Development Strategy

In the report of the "Nineteenth National Congress" of the Communist Party of China, General Secretary Xi Jinping instructed that we should accelerate the construction of a manufacturing powerhouse, develop advanced manufacturing industry, continue to do a good job in the article of deep integration of informatization and industrialization, promote intelligent manufacturing, and accelerate the development of the manufacturing industry to digital, networked and intelligent. "Made in China 2025" released in 2015 adheres to the new road of industrialization with Chinese characteristics, with the theme of promoting innovation and development of the manufacturing industry, focusing on improving quality and efficiency, accelerating the deep integration of the new generation of information technology and manufacturing as the main line, promoting intelligent manufacturing as the main direction, and promoting industrial transformation and upgrading. Cultivate a manufacturing culture with Chinese characteristics and realize the historical leap from big to strong manufacturing. Actively promote the deep integration of the Internet, big data and artificial intelligence with the real economy, and expand and strengthen the digital economy. It is necessary to promote the transformation, optimization and upgrading of industrial technology with intelligent manufacturing as the main direction, promote the fundamental transformation of the manufacturing industry model and enterprise form, and promote China's industry to move to the middle and high end of the global value chain. China's industry firmly seizes the strategic opportunity of Internet development and vigorously promotes "Internet + Manufacturing" model. Leading enterprises in manufacturing and Internet have deployed one after another, applying new technologies such as industrial Internet and cloud computing to the manufacturing field. On the one hand, a number of enterprises with a good foundation in digital manufacturing have successfully upgraded digital networking and become a demonstration area for digital networked manufacturing ; on the other hand, a large number of enterprises which have not completed digital manufacturing have adopted the technical route of promoting digital manufacturing and "Internet + manufacturing" in parallel, completed the upgrade of digital manufacturing, and at the same time leaped to the stage of "Internet + manufacturing", realizing the optimization and upgrading of enterprises.

3. Cultivation and Evaluation of High-value Patents for Intelligent Manufacturing

In recent years, under the encouragement and guidance of relevant national intellectual property policies and measures, national and local intellectual property offices, science and technology management departments, enterprises, university scientific research institutes, intellectual property service institutions and scientific researchers have actively promoted and participated in the practice of High-value patent cultivation. High-value patent cultivation projects, competitions and training at all levels and of all types. Training has been carried out one after another. Especially in the field of intelligent manufacturing, it is imperative to cultivate and rate High-value patents. Therefore, the following are two highly valuable models in the field of High-value patent cultivation and evaluation of intelligent manufacturing.

3.1. High-value Patent Cultivation "Five Rings" Model

Xing Zhanlei and other scholars proposed a "five-ring" model to cultivate a High-value patent system. From five links: policy ring, innovation ring, application ring, review ring and evaluation operation ring, a High-value patent cultivation process based on life cycle theory is proposed.

The policy ring mainly refers to the design-related incentive policies or management measures conducive to the application and operation of High-value patents. In the policy ring, the leading decision-making level and relevant intellectual property management departments should play a major supporting and leading role, solve the problems of optimizing the relevant institutional environment and building a high-level intellectual property public service information platform, and strengthen the supervision, control and guidance functions of the cultivation process. At the same time, we will implement and promote the "patent navigation" project, carry out demand research and accurate research and development, combine "patent retrieval analysis", actively show the decisive role of patent resource allocation, and ultimately improve the integration and adaptability of High-value patents in leading and changing the development of the technical field.

The innovation ring involves the full cooperation of relevant innovation subject departments and is a key link to ensure the quality of High-value patent cultivation. In the process of collaborative innovation, the innovation department is the management decision-making department for the long-term operation of the High-value patent cultivation system. It is mainly responsible for formulating the operation strategy of the innovation subject and the overall intellectual property management decision-making function, providing the necessary resource allocation for the smooth development of internal High-value patent cultivation. Undertake tasks such as determining the direction of research and development, technological upgrading and formulating innovation plans. According to the conclusions of relevant patent literature review, patent retrieval, patent information analysis, and the progress status of scientific research projects, maintain good and smooth communication with the patent administration department, and carry out technical cooperation in strategic aspects such as patent protection and patent layout.

The application ring is the support for patent right acquisition, patent layout and future patent implementation, and is the basic stage of legal value formation. The application ring for High-value patents mainly involves intellectual property management departments or patent agencies. The core of the application ring is to ensure the quality of patent application text writing. At the same time, it is necessary to comprehensively analyze and control the types and timing of patent applications.

The review ring mainly involves the Patent Office and the Patent Reexamination Board. At this stage, the examiner needs to conduct a comprehensive review of the patent application text. Obtain existing technologies related to patent applications through full search, to make an objective evaluation of novelty and creativity, and feed it back to the applicant in the form of a notice of opinion. In the review ring, the examiner's sense of responsibility and patent review level, as well as the communication between the applicant and the examiner, play a key role in the cultivation of High-value patents.

The cultivation cycle of High-value patents is generally relatively long, especially with the simultaneous participation of multiple parties, and the evaluation process must be managed and controlled. On the one hand, it is necessary to study and determine the quality evaluation indicators and systems of each link. More importantly, colleges and universities should select a group of high-level intellectual property service institutions with high professional capabilities and good reputation, and establish strategic cooperation with them, specializing in the selection

and recommendation of high-quality and High-value patents, so that they can the cultivation of High-value patents is more effective and accurate. (As shown in Figure 1).

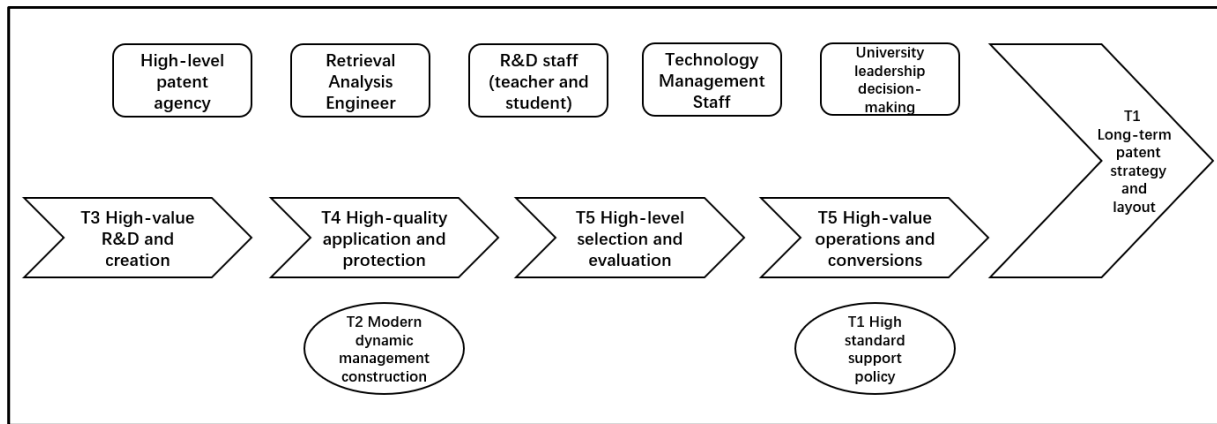


Figure 1. "Five Rings" model flow chart

(Xing Zhanlei, Ma Guangqi, Sun Yanlei, Liu Guojun, "Construction and Promotion of High-value Patent Cultivation System")

3.2. Classification and Evaluation Model of High-value Patents

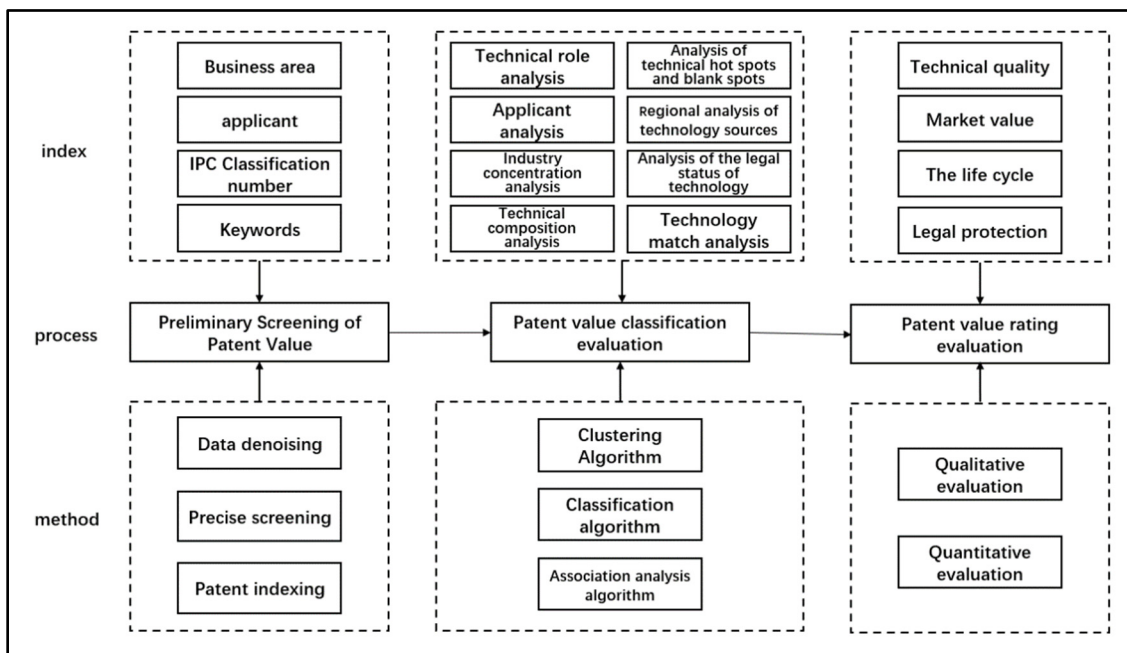


Figure 2. Flow chart of classification and grading evaluation model

(Zheng Qian, Yuan Jie, Yang Lihong, "Construction and Application of High-value Patent Classification and Evaluation Model")

Zheng Qian and other scholars have built a set of High-value patent evaluation models for classification and classification. The model carries out preliminary screening, hierarchical evaluation and classified evaluation of patents in 3 stages. The evaluation process is carried out by specialized evaluation institutions and personnel in accordance with national laws and regulations and in accordance with the principles, scope, procedures and standards of asset evaluation. Specifically, patent classification and classification are the preprocessing and reprocessing of patent information. Boolean logic analysis is carried out from the technical value, legal value, market value and other perspectives of patents. Through the preliminary processes such as collection, cleaning, desensitization, labeling, collation, etc., follow-up means

such as clustering, classification, stratification, system and other follow-up methods to interpret information and mine data, form an evaluation report of patent classification and grading. The specific process is shown in Figure 2.

Step One: Preliminary Screening of Patent Value

In order to quickly excavate High-value patents, it is necessary to screen patent data before patent analysis, remove most low-value patents, improve work efficiency and save costs. This step can be implemented through the identification model described earlier.

Step two: Patent value classification evaluation

Relying on the basic database of patents, clustering algorithms are mainly used for classification. Clustering algorithms are mainly based on patent text clustering. The internal attributes of patents are intuitively revealed in the form of patent maps, and several clustering families are obtained for patent co-citation clustering. Clustering is read and named through domain experts, and then from patents. The two dimensions of dynamic and patent quality carry out patent combination analysis of the cluster family, among which the number of patent applications and the patent family with a high frequency of citation are the key technologies. At the same time, finding document similarity based on text mining technology, quantitatively define the novelty of the patented technology through the novelty measurement function, to quantitatively evaluate the patent quality of a certain industry.

Step Three: Patent Value Rating Evaluation

This model comprehensively considers the technical quality, application value, service life cycle, profitability and risk of patents and other factors, and divides the hierarchical evaluation indicators into 4 categories: technical quality, market value, life cycle and legal protection. Among them, technology value is the fundamental factor determining the patent value, which mainly includes detailed indicators such as technological advancement, technological maturity, technology monopoly, technology coverage, etc. Market value is another important factor determining patent value, which mainly includes detailed indicators such as market scale, market application, market competition, licensing and transfer. The life cycle mainly evaluates the sustainability of patents, including technology life cycle, patent life and other indicators. Legal protection focuses on assessing the stability and market value guarantee of patents, mainly including detailed indicators such as patent litigation, difficulty of infringement, patent protection scope, patent text quality, etc. As a dynamic variable of patent value, the weight and utility of evaluation indicators in the evaluation system are not fixed and may change over time. Therefore, it is necessary to consider the dynamic evolution characteristics of patent indicators.

4. Intelligent Manufacturing High-value Patent Operation Plan

Cultivating and carrying out High-value patent operations is a realistic requirement to improve the quality of innovation and seek the best economic benefits under supply-side structural reform. In order to further strengthen reform and innovation, open up the whole chain of mining, evaluation, transformation and application of High-value patents of intelligent manufacturing and high-quality scientific and technological achievements of intelligent manufacturing, realize the transformation of patents from "quantity" accumulation to "quality", speed up patent conversion, from the transformation of a single subject to a coordinated transformation of multiple parties, accelerate the transformation of patent achievements and resource advantages into technological and industrial advantages, give full play to the important supporting role of High-value patents and high-quality scientific and technological achievements in the development of intelligent manufacturing. The focus is on four adherences: one is to adhere to the result-oriented; the other is to adhere to the goal-oriented; the third is to adhere to the problem-oriented; the fourth is to adhere to the service-oriented. Its operating plan is as follows:

(1) Build a High-value patent creation system for intelligent manufacturing. Carry out industrial planning patent navigation projects and High-value patent cultivation projects in the field of intelligent manufacturing, and build High-value patent pools or patent combinations in relevant industries; encourage universities and scientific research institutes to improve their original innovation capabilities and actively carry out technological innovation in the field of intelligent manufacturing; standardize and guide scientific researchers to carry out High-value patent creation, improve policies related to the transformation of scientific and technological achievements of scientific researchers; strengthen the training of technical transfer professionals, encourage social organizations and intellectual property professional institutions to carry out public welfare intellectual property talent training, and strengthen the training of technical managers.

(2) Establish a scientific High-value patent evaluation system and method. In view of the lack of unified standards for intellectual property value evaluation and the low market recognition of evaluation results, need to improve the evaluation mechanism of scientific and technological achievements, develop a multi-subject online High-value patent evaluation system; build a risk-sharing pledge financing evaluation model, and promote intellectual property professional institutions to participate in risk compensation.

(3) Optimize the transfer and transformation mechanism of intelligent manufacturing High-value patents. In accordance with the principle of the whole chain, establish high-level operation service institutions and broaden the channels for obtaining High-value patents; promote the docking of universities, scientific research institutes and enterprises, promote enterprises to undertake and transform patents of colleges and universities, and accelerate the transformation of patents; guide enterprises to obtain financing through patent acquisition licensing, financial leasing, patent securitization, pledge financing, etc.; improve the intellectual property pledge financing policy, focus on screening High-value patents in the field of intelligent manufacturing, and combine trademarks and copyrights to promote intellectual property securitization and innovative financing Insurance products to reduce corporate financing costs and shorten the financing cycle.

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