

# Research of Patent Gradation Review System Based on the Comparison between Academic Papers and Patent Documents

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**ABSTRACT.** Academic papers and patents are documents that represent the advanced productivity of mankind. At present, the quantity and quality of academic papers in China are improving rapidly, while patents are trapped in the dilemma of 'large but not strong'. Through carding the status quo of domestic patent documents, comparing the similarities and differences between academic papers and patent documents, referring to the advantages of the academic paper evaluation, put forward a solution to improve patent quality by implementing patent gradation review system, and analyzed the feasibility, the implementation strategies and suggestions of promoting the system, so as to provide references for the improvement of domestic patent quality.

**KEYWORDS:** patent quality; gradation review; academic evaluation

## 1. Introduction

In recent years, the number of domestic invention patent applications has surged, and in 2011, it surpassed the United States to take the first place in the world, making gratifying achievements. However, the number of patents won does not mean that China's technological innovation capacity has surpassed the United States, Japan and other developed countries. At present, many high-end products in China are still dependent on imports, and key technologies are limited. It is in the transition stage from low-end to high-end. According to the statistics of the ministry of commerce, in 2018, the import of intellectual property rights royalties was 235.52 billion yuan, up 22%, and the export was 36.8 billion yuan, up 14.4%, with a large trade deficit. Many scholars believe that China's patents are large in quantity but low in quality, resulting in a large number of idle patents and a waste of social resources. Low patent quality also causes many negative effects, such as breaking the

interest balance mechanism of the patent system, hindering international competition, hindering innovation and scientific and technological progress, and increasing rights disputes. How to improve the quality of patents becomes a problem.

This paper based on the analysis of the status quo and causes of patent quality, draws on the advantages of paper evaluation from the perspective of the comparison between academic papers and patent literature, puts forward the feasibility analysis, implementation strategies and suggestions for the implementation of the patent grading review system in China, so as to play a role in improving the status quo of patent quality in China.

## **2. Status quo and cause analysis of patent quality in China**

### ***2.1 Status of patent quality in China***

#### ***2.1.1 The number of applications has reached new highs***

From 2009 to 2018, China's annual application for invention patents increased fivefold, with an average annual growth rate of about 20 percent. The number of invention patent applications ranked first in the world for eight consecutive years. China's patent development started late, the foundation is thin, so in the process of rapid development has produced many problems. For example, according to "the national patent development strategy of China (2011-2020)", the annual number of patent applications should reach 2 million by 2015. Subsidies have been introduced to boost the number of patents. However, the status quo of patent quality is not optimistic. By studying the subsidy policies of governments at all levels for many years, Zhang Jie and other scholars believed that the subsidy policies promoted the growth of patent quantity, but had significant negative effect on patent quality and inhibitory effect.

#### ***2.1.2 Low implementation rate***

Patent quality is low and patent technology is not mature, restrict the exploitation and transfer license of patent. According to the 2017 blue book on the rule of law by the Chinese academy of social sciences, 2.788 million patents were approved in China between 2012 and 2014, but only 56,000 patent licensing contracts were signed, accounting for 2% of the total.

#### ***2.1.3 Low maintenance rate***

Generally, the patentee will give up maintenance the patent with low quality and poor market prospect in advance [1]. According to statistics, as of 2014, the average maintenance life of invention patents in China was only 6 years, and only 7.6% of them lasted more than 10 years, with low patent maintenance efficiency. Although this may be related to the high domestic maintenance cost, it is also closely related to the low patent quality. It is difficult for applicants to benefit from low-quality patents.

## ***2.2 Cause analysis of patent status in China***

### ***2.2.1 Decisions on the development stage of a country***

China is still in the stage of rapid development, with a large amount of funds invested in infrastructure construction and people's livelihood, insufficient investment in basic research, unreasonable structure, and lack of leading talents and top teams. At present, although we have made good achievements in some local fields, we still have some defects in key areas, such as incomplete varieties, low quality, insufficient supply of medium and high-end products, and limitation of key components and technologies. As a result, the overall patent quality lags behind that of developed countries.

### ***2.2.2 There are drawbacks in the review system***

Patent backlog and pro-patent policy lead to the patent examination department to implement a relatively loose patent examination system, which does not pay attention to the substantive examination of patent quality, and will also result in the flood of low-quality patents [2]. The flood of low-quality patents will also increase the asymmetry of patent quality information, leading to the failure of high-quality patents to obtain matching benefits and dampening the enthusiasm of applicants. Recently, the state intellectual property office (sipo) proposed a patent quality improvement project, aiming at comprehensively promoting the quality improvement of all links in the chain of patent manufacturing, application, agency, examination, protection and application.

## **3. Comparative analysis of academic papers and patent documents**

### ***3.1 The development status of academic papers in China***

According to the "Science Citation Index", Chinese authors published 361,200 SCI papers in 2017, accounting for 18.6 percent of the total, ranking second in the world for nine consecutive years, second only to the United States. Chinese papers were cited for 22.724 million times, an increase of 17.4% from 2017, ranking second in the world. Chinese papers were cited an average of 10.00 times, a 6.4% increase over 2017, still lower than the world average of 12.61 times per paper. SCI database includes 173 kinds of Chinese sci-tech journals, increase eleven; In 2017, the number of outstanding scientific and technological papers in China was 281,000, an increase of 7.0% compared with 2016. Although the number of citations per article is still lower than the world average, on the one hand, the volume of Chinese papers is larger, and the citation growth causes the average value to keep rising; on the other hand, citations are lagging behind, which will take several years to fully reflect. In addition to the rapid growth in the number of Chinese academic papers, the quality of the papers has also made great progress, and the influence of the papers has further increased, becoming one of the main forces of scientific research in the world.

Compared with the overall quality of patents is still at a low level, the quality of domestic academic papers has been growing steadily. Through the comparative analysis of the two, the following article tries to find a new way to improve patent quality.

### ***3.2 Similarities and differences between academic papers and patent documents***

Academic papers refer to scientific research results or scientific records of innovative ideas and knowledge of an academic subject, which are used for publication and exchange activities. Patent documents refer to the general names of official documents and publications produced by national patent offices and international patent organizations in the process of patent examination and approval.

#### ***3.2.1 Audit methods***

Academic papers are often peer-reviewed for quality review. Journal editors treat papers anonymously, a review panel composed of several experts in the same field makes a reasonable assessment of the quality of the papers, and then the editor decides whether the papers can be published. Therefore, the quality of papers published smoothly is mostly matched with the influence of journals. Patents are granted by patent examiners, in accordance with the examination regulations, check whether the patent conforms to the requirements of practicality, creativity and novelty. Examiners usually do not evaluate the level of technological innovation, application prospects. So the granting of a patent does not fully explain the quality of the patent.

#### ***3.2.2 Publishing territory***

Academic papers are mostly in the stage of theoretical research, and can be studied and communicated. In principle, they can only be published publicly once. Patent technology represents the current advanced productive forces, which can create huge benefits. Therefore, it is difficult to establish a universal standard for the examination of patent applications. Different countries take different control measures on patents. On the one hand, it makes it more difficult for foreign applicants to apply for patents in their own countries and restricts other countries from obtaining technological advantages. On the one hand, encouraging domestic patent applications to protect domestic technological innovation may result in low-quality patents.

#### ***3.2.3 Source of author***

Academic papers focus on theoretical research and need to go through long-term theoretical learning. Therefore, universities and research institutes with long-term, stable and high scientific research investment are the main contributors to academic papers in the world. In addition, some of them come from enterprises, government agencies and individuals. Patents focus on practical technology and attach importance to technological innovation. The sources of applicants are relatively complex and widely distributed in enterprises, universities and individuals. From an organizational perspective, academic papers are more likely to form codes of

conduct within the industry, while patents need to be regulated by government agencies.

### ***3.3 Characteristics of the paper review system***

#### ***3.3.1 Peer review system***

Peer review system refers to a system in which the journal editor anonymously processes the submission after the author has submitted the paper, invites scholars with professional knowledge in the same field to review the academic quality of the paper, puts forward opinions and judgments, and then the chief editor decides whether the paper is suitable for publication in the journal according to the review results. The peer review system is fair, which can make a realistic evaluation of the paper according to the reviewer's professional knowledge and protect the rights and interests of contributors to the greatest extent. In order to ensure the fairness and reasonableness of the review, there should be no conflict of interest or mutual benefit between the reviewer and the author.

#### ***3.3.2 Core journal system***

Bradford revealed the law of literature concentration and dispersion, which showed that there was a "core effect" in journals, and thus derived the concept of "core journals". "Core journal" refers to the main journal of a certain discipline, refers to the professional journal with a large amount of professional information and high quality, which can represent the development level of professional discipline and is recognized by researchers of the discipline. At present, the popular selection system of core journals at home and abroad includes SCI, EI, CSSCI, etc. Some core journal selection system appeared more detailed journal grading partition, for example: the Chinese academy of sciences journal partition table will be in accordance with the categories of disciplines set of small class discipline, will be three years before the average impact factor of 5%, 20%, 50% are divided into 1, 2, 3, 4 as simple division of quality papers; According to Thomson Reuters, the company is divided into four subdivisions in descending order of last year's impact factors. As a widely recognized academic evaluation method, core journals and their classification system can effectively screen academic papers of different values and maintain the overall quality of academic papers.

#### ***3.3.3 Restrictive relationship between peer review and core journals***

Peer review and core journal system jointly maintain the fairness of academic paper quality evaluation, among which the citation relationship plays an important role. On the one hand, the reader's citation of the paper is the affirmation of the cited article's academic achievements; on the other hand, it determines the impact factor of the journal. Journals with higher impact factor will attract high level academic papers published high quality academic, reputation for maintaining the journal, journal of management staff will try to ensure fairness, so that they can ensure the quality of the selected articles at a high level.

#### **4. Patent grading review mechanism and its feasibility analysis**

##### ***4.1 Connotation and characteristics of patent grading review mechanism***

Patent grading mechanism refers to the process of granting corresponding patent certificates for patents of different quality by setting multi-level patent auditing threshold. Its main purpose is to distinguish high-quality patents from low-quality patents, reduce the incidence of low-quality patents and increase the efficiency of social operation.

From the perspective of institutional research, some scholars have recognized the necessity of patent grading review. For example, ATAL Vidya proposed to implement a two-tier grading system for patent review, so that inventors could choose between ordinary patent and "gold-plated patent" with higher cost and more stringent review, endorsing high-quality patents with higher gold content [3]. Wu hong suggested that colleges and universities should implement patent grading management, so as to revitalize scientific research resources of colleges and universities, improve patent quality and management performance.

From the perspective of the implementation of the system, large-scale implementation has not yet begun, mainly in some pilot projects. For example, the United States began testing the public review program in 2007, aiming to involve the public in the patent review process to speed up the approval process and improve the review quality. After the review period, the existing technical documents will be transferred to patent examiners for reference. The project can be likened to "patent peer review", providing an idea for grading patents. Hitachi adopted a hierarchical management mechanism for patent value, and adopted different management methods for different levels of patents, and obtained good economic returns [4].

##### ***4.2 Feasibility analysis of establishing a hierarchical patent examination system***

###### ***4.2.1 In line with the national conditions of China's patent development***

According to the report of the national bureau of statistics, in 2018, the total full-time workload of r&d personnel in China was 4.19 million years, ranking first in the world for six consecutive years, and producing a large number of scientific and technological papers and invention patents. In the past, the population of innovative countries has never reached the level of one billion, the number of patents produced is limited, and the demand for graded patent examination is not high. China, with its 1.4 billion people, will produce more patents than ever before. Faced with a large number of patents and a growing number of patent applications, a one-cut approach cannot guarantee the removal of low-quality patents [5]. On the other hand, the patent system originated in western countries, the public has a high sense of innovation, and relevant policies are relatively perfect. However, China's patent system has only been more than 30 years, and the number of patents has increased rapidly. Stiglitz believes that the American intellectual property system is obviously hampered by too many interests, and the forced promotion of such a system in developing

countries will have a bad effect. The solution is to redesign the intellectual property system [6].

#### ***4.2.2 Make up for some grading defects of PCT patent***

In the past, in addition to the domestic patent examination, the inventor can also apply for PCT patent to expand the geographical protection scope of the patent. Because the PCT patent application is more difficult, more expensive and has a longer time span, patents that pass the PCT patent examination are generally considered to be of higher quality. Many multinational companies and top universities are keen on PCT patent applications, and the number of PCT applications in China is also growing rapidly [27]. However, PCT patent fees often require tens of thousands of yuan, which is difficult for independent inventors and SMEs to bear. At the same time, some patents are only applicable in China, not suitable for other countries; For the sake of secrecy, military defense patent can not apply for PCT patent; The number of PCT patent applications accounted for a low proportion of the total patents, and the high quality patents could not be fully reflected. Therefore, PCT patent can not fully meet the needs of patent quality classification.

### **5. Tentative ideas and Suggestions on the application of patent grading examination system**

#### ***5.1 Process assumption of implementing the patent grading examination system***

The patent grading process can be set as follows: applicants can apply for "ordinary patent" or "high quality patent" according to their own needs and self-assessment of patent quality. The routine patent examination is conducted in accordance with step 1. The applicant submits the patent and the examiner decides whether to grant the patent according to the previous examination standards. The "high quality patent" application will follow step 2. The examiners will conduct a rigorous review of the patent application. At the same time, there is a link between general review and strict review. General review can recommend high-quality patents to enter step 2 for review, while patents that fail to pass step 2 can enter step 1 for review, so as to facilitate more accurate classification of applied patents according to review standards. The process of patent grading examination is shown in figure 2, see Fig.1.

The key to the successful implementation of the patent grading audit lies in the formulation and implementation of the audit standards. On the one hand, the new standards should ensure the screening of high-quality patents; on the other hand, a high-quality audit team should guard the pass.

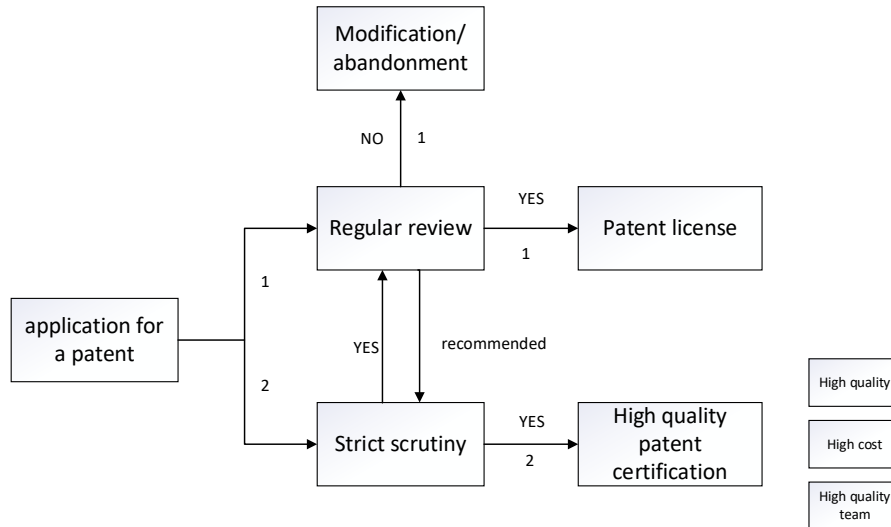


Figure. 1 Schematic diagram of patent grading review process

## 5.2 Suggestions for implementing the patent grading examination system

### 5.2.1 Reverse patent concept

To reverse the one-sided emphasis on the number of patents, the quality of patents should be equal to the number of patents. At present, the number of invention patents is one of the important indicators in the performance assessment of enterprises and universities. This way of assessment ignores the assessment of patent quality, inevitably biased. On the one hand, it is difficult to quantify the assessment of patent quality; on the other hand, the overall patent quality is low and the degree of differentiation is small. The establishment of a patent grading examination mechanism can comprehensively compare the number and quality of patents of enterprises and universities through the number and proportion of "high-quality patents", so as to form a benign encouragement mechanism and avoid "false imitation".

### 5.2.2 Establish a three-level indexing system

Establish a three-level indexing system including PCT patents, "high quality patents" and ordinary patents to provide reference for potential users. It is difficult for potential users to find the high quality patents they need from the huge amount of patent data. On the one hand, the patent citation is not standard and information is missing, the reference value is greatly reduced; On the other hand, the lack of more powerful screening means, usually only through manual reading or patent database to establish the value evaluation system for reference, low efficiency. By establishing the three-level classification of PCT patent, "high-quality patent" and ordinary



patent, it can realize the fine indexing of high-quality patent, facilitate users to quickly find the core patent, and realize the full application of high-quality patent.

### **5.2.3 Promote graded patent management**

Enterprises and universities have been faced with the problem of patent management for a long time. On the other hand, the lack of management personnel and the difficulty in patent operation make patents a heavy burden for enterprises and universities. Through the patent quality grading examination system, the "high quality patent" can be screened out, bringing about a turning point for the patent management of enterprises and universities. Enterprises and universities may, through the patent grading examination mechanism, carry out patent grading management, and adopt corresponding treatment methods for patents at different levels to avoid confusion in patent management.

## **6. Conclusion**

By comparing the similarities and differences between academic papers and patent literature, the advantages of academic literature evaluation can be used for reference to patent quality evaluation, which can be realized by establishing a patent grading review mechanism. Under the current background of our country, the system of patent grading examination has already met the conditions for implementation.

Compared with academic evaluation, patent review involves more interests, which makes it difficult to learn from the peer review system of academic papers. However, it is feasible to implement the patent quality grading management mechanism by establishing a more rigorous patent review mechanism. The application of patent grading examination can guide the "quality differentiation" within patents and promote the transformation license of high-quality patents, which is a possible way to improve the overall quality of domestic patents.

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