Verification of Implementation Effects and Implications of the UK Patent Open Licensing System: A Postprint Analysis Based on Patent Quantity and Quality

Authors: Wan Xiaoli, Feng Binghao, Zhang Yahong, Yu Jiaqi

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Abstract

[Purpose/Significance] The United Kingdom is the pioneer of the patent open licensing system. Verifying the implementation effects of its system and exploring its advantages and disadvantages can facilitate the scientific introduction and implementation of this system in China. [Method/Process] Using the Innography database, this study conducts an in-depth analysis of UK open-licensed patents from two dimensions: quantity and quality. The quantitative analysis includes examination of temporal trends, entities, and technology fields, while the quality analysis focuses primarily on patent strength assessment. [Results/Conclusions] From 2003 to 2019, the average annual registration volume of UK open-licensed patents was merely 1,364. Among valid open-licensed patents, 92% are owned by the top 20 foreign large enterprises, with universities holding only 16 patents. Technologies are concentrated in the automotive sector and computer software field, indicating that the system' s overall attractiveness is limited and uneven. However, the quality of open-licensed patents is not low; moreover, among valid open-licensed patents, 9% are high-strength patents and there are a small number of standard-essential patents, with no significant increase in infringement, which is better than theoretically derived results. Based on these findings, when introducing this system, China should pay attention to: the discount magnitude of annual fees, the openness of licensing fees, the effectiveness of supplementary incentive mechanisms, and the applicability to Chinese universities and standard-essential patents.

Full Text

Verification and Enlightenment of the Implementation Effect of the UK' s Patent Open Licensing System: An Analysis Based on Patent Quantity and Quality

Wan Xiaoli, Feng Binghao, Zhang Yahong, Yu Jiaqi
School of Intellectual Property, South China University of Technology, Guangzhou 510006

Abstract:
[**Purpose/Significance**] As the pioneer of the patent open licensing system, verifying the implementation effects of the UK' s system and exploring its advantages and disadvantages can inform the scientific introduction and implementation of this system in China. [**Method/Process**] Using the Innography database, this paper conducts an in-depth analysis of UK open licensing patents from two dimensions: quantity and quality. The quantitative analysis includes temporal, subject, and technological field perspectives, while the quality analysis focuses primarily on patent strength. [**Results/Conclusions**] From 2003 to 2019, the average annual registration of UK open licensing patents was only 1,364. Among valid open licensing patents, 92% are owned by the top 20 foreign enterprises, with universities holding only 16 patents, and technologies concentrated in the automotive and computer software fields, indicating that the system' s overall appeal is limited and uneven. However, the quality of open licensing patents is not low; indeed, 9% of valid open licensing patents are high-strength patents, with a small number of standard patents included, and infringement has not increased significantly—results better than theoretical predictions. Based on these findings, China should pay attention to the following when introducing this system: the discount rate of annual fees, the transparency of licensing fees, the effectiveness of supporting incentive policies, and the applicability of the system to Chinese universities and standard patents.

Keywords: Licences of Right; Patent Quantity; Patent Quality; Implementation Effect

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1. Introduction

To promote patent implementation and utilization and revive trade, the United Kingdom first created the Licences of Right (LOR) system in 1919, which was formalized in 1977 and remains in use today [1-3]. The UK' s open licensing is divided into voluntary and compulsory types. Since compulsory open licensing primarily serves as a deterrent with extremely rare implementation cases, most countries have only introduced voluntary open licensing, such as Germany, France, Italy, Singapore, Brazil, and Russia. India introduced compulsory open licensing in 1999 but abolished it in 2002 for allegedly violating the "case-by-case" principle of the TRIPS Agreement [4].

According to the latest revised version of the UK Patents Act 1977 effective July 1, 2020, the voluntary open licensing system comprises four basic elements: registration, implementation, infringement remedies, and revocation. Patent holders voluntarily apply to the patent office to register open licenses, and anyone can negotiate with the patent holder to obtain a license. If negotiation fails, they may request a ruling from the patent office. After registration, patent renewal fees are halved, but when patents are infringed, injunctions are restricted, and licensees are granted litigation rights. With the consent of all licensees, patent holders may revoke open licensing registration at any time by paying the reduced renewal fees.

China' s fourth amendment to the Patent Law, passed on October 17, 2020, introduced voluntary open licensing, sparking heated academic debate focused on: whether licensing fees should be determined beforehand or negotiated afterward, whether fee disputes should be subject to administrative adjudication, whether annual fees should be discounted, whether restrictions on injunctive relief in infringement cases are appropriate, whether licensees should be granted litigation rights, and whether revocation should be conditional [4-8]. To address these questions, domestic scholars have been eager to introduce different national legal systems for reference or to elaborate on the system' s theoretical pros and cons, but few have conducted empirical research on implementation effects. Japan attempted to introduce this system a decade ago and commissioned the University of Tokyo' s Policy Research Institute for empirical research on the UK open licensing system' s implementation effects [9]. Although dated, its statistical analysis approach is commendable, though the analytical perspective could be expanded, particularly regarding patent quality analysis. Therefore, this paper focuses specifically on the UK' s voluntary open licensing system, first deconstructing its operational logic, then verifying theoretical predictions through empirical analysis, and deriving enlightenment to provide valuable references for China' s introduction and implementation of this system.

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2. Operational Logic of the UK Patent Open Licensing System

The operational logic of the UK' s patent open licensing system is illustrated in Figure 1 [Figure 1: see original paper]. The fundamental purpose of the system is to promote patent implementation and utilization. Achieving this goal requires two basic conditions: (1) patent holders must be willing to offer patents for licensing, and (2) users must be willing to purchase licenses, so that licensing transactions can be concluded. To satisfy these conditions, the UK designed a basic mechanism: patent holders can use the official platform to publish their open licensing intentions, making it easy for users to find and obtain licenses. To enhance the system' s appeal, the UK also designed incentive measures and supporting rules to motivate both patent holders and users.

Theoretically, the UK patent open licensing system promotes transactions by

incentivizing both parties, thereby advancing patent implementation. On one hand, the publicity effect of official publication [10], annual fee discounts [4], and revocation freedom [9] can attract patent holders to register open licenses, particularly large enterprises burdened by heavy patent renewal fees [9] and universities and individuals who apply for patents for licensing purposes [8]. Patent holders can also use this mechanism to avoid accusations of patent abuse [11]. Additionally, revocation freedom may attract patent holders to register patents with important technology but uncertain market value [9]. On the other hand, the publicity and non-refusal nature of open licensing makes users more trusting, with lower search costs (the UK established an open licensing patent database in 2009 to facilitate user access to information) and negotiation costs. Lower licensing fees make it easier to conclude licensing transactions—a view unanimously endorsed by most scholars. Furthermore, licensing adjudication protects user interests while improving transaction efficiency [5]; restrictions on injunctive relief in infringement remedies allow users to "board first and pay later" [4], facilitating patent implementation [9]; and granting licensees litigation rights protects their economic interests, both curbing infringement and encouraging users to purchase licenses.

However, every system has two sides, and the open licensing system is no exception. While producing positive effects, it also brings negative impacts: (1) The system' s attractiveness to both patent holders and users is extremely limited. Because open licensing means inability to select users, inability to refuse, low licensing fees, and increased management costs from multi-party licensing [2], these factors may dampen patent holders' enthusiasm. While users can purchase licenses at low cost and conveniently, they cannot form monopoly interests. Most are primarily seeking to reduce infringement risk, and with the "board first, pay later" option, their motivation to purchase licenses is also very limited. Some scholars are more optimistic, arguing that open licensing merely adds an optional model and it is unrealistic to expect it to significantly improve patent implementation rates [4]. (2) Patents registered for open licensing may be of low quality, affecting licensing transactions. Similarly, because open licensing cannot be refused, the patent' s monopolistic nature is weakened, causing patent holders to typically not open-license core patents [12]. They may instead open-license patents they do not use, patents without competitors, or patents already widely licensed (especially standard patents) [13]. Some scholars even worry that halving renewal fees may attract junk patents [8]. (3) The annual fee discount policy only benefits large enterprises, creating more unfairness. Since UK patent renewal fees are not high, halving them is more attractive to enterprises with large patent portfolios, who use the opportunity to reduce operational burdens or strengthen patent layout, further compressing competition space for small and medium enterprises and causing unfairness. Additionally, the discount policy keeps patents that should enter the public domain in force, somewhat harming public interests [2]. Therefore, the unfairness caused by the annual fee discount policy has become a focus in research on introducing open licensing systems in various countries. (4) Restricting injunctions in infringe-

ment remedies may encourage infringement [14]. (5) Licensing adjudication may increase administrative and judicial costs [15].

To verify the actual effects of the UK' s open licensing system, this paper conducts quantitative and quality analyses of UK open licensing patents to explore the system' s pros and cons and clear the fog for legislators.

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3. Quantitative Analysis of UK Open Licensing Patents

3.1 Overall Status of UK Open Licensing Patents There are two types of patents effective in the UK: UK patents and European patents designating the UK. This paper analyzes both types. Using the global leading Innography patent database and searching the legal status field with the keyword "licences of right," we found that from January 1, 1977 (when the UK open licensing system was basically finalized) to July 15, 2020, there were 1,219,593 patents authorized in the UK, of which 24,156 registered open licenses, accounting for 1.98%; there were 701,533 valid patents in the UK, of which 9,594 were valid open licensing patents, accounting for 1.37%. Clearly, the overall proportion of open licensing patents is not high. Unfortunately, neither the UK official website nor the Innography database contains records of licenses issued for open licensing patents, so whether the system truly promotes licensing remains unknown. However, it can at least be confirmed that open licensing is only a supplement to existing licensing models and is unlikely to significantly improve patent implementation rates [4].

According to the UK Intellectual Property Office's annual report (https://www.gov.uk/search/research-and-statistic) and the UK open licensing patent database (https://www.ipo.gov.uk/p-licenceo-right.htm), annual statistics on registration, revocation, and validity of UK open licensing patents show (see Figure 2 [Figure 2: see original paper]) that from 2003 to 2019, the annual registration volume remained relatively stable at just over 1,000, with an average annual registration of 1,364. Annual revocation volume was minimal, generally kept below 30. The validity rate (valid volume/registration volume) gradually increased from 0.2% in 2003 to 99.4% in 2019. Overall, the UK' s annual registration volume is stable but relatively small, indicating that the open licensing system' s appeal is very limited. The revocation system gives patent holders an opportunity to "change their minds," and although the number of "mind changes" is small, it at least shows that the freedom of revocation can attract uncertain patents. The earlier the application time, the lower the validity rate. Since revocation numbers are small, the main reason should be termination due to non-payment of renewal fees, which reflects two aspects of information: first, half the renewal fee remains a burden for patent holders; conversely, the main purpose of registration may be to reduce renewal fees. Second, most patents may not have been licensed and thus cannot recover costs.

3.2 Temporal Analysis of Valid UK Open Licensing Patents The UK open licensing patent database publicly discloses currently valid open licensing patents. As of March 24, 2020, there were 9,738 patents (with UK patents accounting for only 17.23%). These patents were then imported into the Innography database for in-depth analysis from temporal, subject, technological, and quality perspectives.

3.2.1 Analysis of Patent Application, Grant, and Registration Years As shown in Figure 3 [Figure 3: see original paper], comparing the application, grant, and registration years of valid UK open licensing patents reveals that in earlier years, the time from application to grant took about 3-5 years, while in recent years it has shortened to about 2 years. Therefore, the annual fee discount for registered open licensing patents is basically equal, as the UK requires renewal fee payment starting from the 5th year after application. In earlier years, the time from grant to registration took about 2-3 years, but in recent years both grant and registration volumes have increased significantly, and the time gap has shortened to within 1 year, showing that the enthusiasm for registration is gradually increasing, with many patents being registered in the same year they are granted.

3.2.2 Time Difference Between Grant Date and Registration Date As shown in Figure 4 [Figure 4: see original paper], 6,120 patents (62.8%) were registered for open licensing within 1 year after grant, indicating that patent holders using this system are very familiar with it, highly motivated, and have mature patent protection strategies, with the purpose of reducing renewal fees being quite obvious. Additionally, patents registered for open licensing more than 5 years after grant still account for a certain proportion (9.1%). These patents are at least 10 years old with relatively obsolete technology, and the main purpose of registration is likely to reduce renewal fees.

3.3 Subject Analysis of Valid UK Open Licensing Patents

3.3.1 Top 20 Patent Holders The top 20 holders of valid UK open licensing patents are shown in Figure 5 [Figure 5: see original paper]. Toyota and IBM rank highest, accounting for 24% and 20% of the total respectively, followed by Peugeot at 9%. The cumulative share of the top three reaches 53%, exceeding half; the top 10 accounts for 82%, and the top 20 reaches 92%. All 20 patent holders are foreign large enterprises, including 10 Japanese companies and 5 American companies, with most being automotive industry enterprises. This shows that the UK' s open licensing system is primarily utilized by foreign large enterprises, especially Japanese and American ones. These enterprises generally have excellent intellectual property teams, are adept at IP strategy, and hold large patent portfolios globally. Their main purpose in using the open licensing system should be to reduce renewal fees while also avoiding accusations of patent abuse (these enterprises may obtain patents in the UK without implementing

them). From another perspective, can large enterprises' open licensing of some patents promote the development of related industries in the UK? This remains to be confirmed.

An in-depth analysis of the proportion of valid patents and valid open licensing patents among the top 20 holders (see Figure 6 [Figure 6: see original paper]) reveals that these enterprises' utilization of the system shows clear polarization: some enterprises are very active, tending to register the vast majority of their patents for open licensing, such as NCR at up to 90% and IBM at 86%; others are more cautious, registering only a small portion, such as Panasonic and CNH as low as 5%, though several enterprises have only recently begun large-scale registration (see Figure 7 [Figure 7: see original paper]). This indicates that enterprises have significantly different strategies for utilizing the open licensing system. For active users with large patent portfolios, the purpose of reducing renewal fees is more obvious. The fact that a few enterprises have recently joined at least reflects increasing awareness of the open licensing system.

3.3.2 Universities Theoretically, universities have relatively high potential to utilize the open licensing system, but in reality, the number is minimal. As shown in Figure 8 [Figure 8: see original paper], 11 universities have registered only 16 open licensing patents, with each registering just one or two. Among them are 5 Japanese universities, 3 American universities, and 3 UK universities. These universities generally have small numbers of valid patents, except for Kyoto University and the University of Tokyo, which have over 100 each. Clearly, the UK' s open licensing system has very little appeal to universities, especially domestic ones, which contradicts theoretical predictions. According to a survey of UK universities by the Japan Intellectual Property Research Institute [13], UK universities first assess market prospects and potential licensees before deciding to apply for and maintain patents. Therefore, UK universities actively seek licensing targets from the application stage, and most patents have identified licensees by the time of grant. Patents without licensees are basically abandoned within 5 years after application, avoiding renewal fee payments. Additionally, UK universities prefer to grant exclusive licenses, which generate higher revenue and have lower management costs. Consequently, UK universities hardly utilize the open licensing system.

3.4 Technological Analysis of Valid UK Open Licensing Patents Importing valid UK open licensing patents into the Innography database for text clustering analysis [16] reveals the technological fields. As shown in Figure 9 [Figure 9: see original paper], technologies are divided into six categories: control unit (CONTROL UNIT), control apparatus (CONTROL APPARATUS), computer program (COMPUTER PROGRAM), control system (CONTROL SYSTEM), power supply (POWER SUPPLY), and electric power (ELECTRIC POWER). These technologies concentrate in the automotive field and computer software field, aligning with the business scope of the top 20 patent holders. Patent density is very high in these fields with severe patent thickets [17], and

non-exclusive licensing is already common practice, making them potentially suitable for open licensing.

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4. Quality Analysis of UK Open Licensing Patents

There are numerous methods for patent quality analysis [18-22]. This paper uses the distinctive tool in the Innography database—Patent Strength. It is comprehensively calculated from indicators reflecting technical information such as forward citations, backward citations, prosecution length, and inventors; legal information such as claims and litigation; and market information such as patent families, patent age, and industries [23-24]. It reflects comprehensive information and can better evaluate patent quality [25], with final results expressed as strength values from 1-100.

It should be particularly noted that valid UK open licensing patents have no infringement litigation records in the Innography database. While data gaps may exist, this at least reflects that open licensing patents are indeed rarely infringed, similar to the situation in Germany. Since the implementation of Germany' s current Patent Act in 1981, only 19 cases have been caused by open licensing, with even fewer infringement lawsuits, far lower than disputes arising from other licenses [4]. In other words, the open licensing system has not encouraged infringement.

4.1 Quality Analysis of Valid UK Open Licensing Patents

4.1.1 Overall Patent Strength Analysis As shown in Figure 10 [Figure 10: see original paper], among 9,738 valid open licensing patents, low-strength patents (0-30 points) number 4,539, accounting for 47%; medium-strength patents (30-70 points) number 4,254, accounting for 44%; and high-strength patents (70-100 points) number 945, accounting for 9%. Clearly, medium- and high-strength patents account for more than half, with high-strength patents approaching 10%. This shows that UK open licensing patents are not of low quality as theoretically predicted, and concerns about an influx of low-quality patents are somewhat overstated, especially since patent holders still need to pay half the renewal fees.

4.1.2 Patent Strength Indicator Analysis As shown in Figure 11 [Figure 11: see original paper], further analysis of the average values of detailed patent strength indicators reveals: First, the mean values of citation counts and forward citations are relatively low, possibly due to the large proportion of young patents or overall scarcity of citation data. However, deeper statistics show that 1,089 patents (11% of the total) have forward citations of 5 times or more [26], a proportion close to that of high-strength patents, indicating that some open licensing patents are indeed high-quality. Second, the mean values of inventor

count, industry distribution, and examination duration are moderate, similar to general patents. Finally, the mean values of patent age, patent families, and claim counts are relatively high. The average patent age is as high as 10 years, clearly demonstrating that annual fee discounts effectively extend the lifecycle of open licensing patents. The average simple patent family size is 11, and 9,638 patents (99% of the total) have more than 3 simple patent families, showing that open licensing patents generally have large patent families, mainly resulting from global patent layout by multinational enterprises. From an economic cost perspective, these patents should have high market value [27]. The average claim count is as high as 10, also a basic strategy in global patent layout. In summary, detailed indicators reflect that UK open licensing patents include some high-quality patents and generally have high market value—somewhat unexpected results.

4.1.3 Comparison of Strength Between Valid and Revoked Patents As shown in Figure 12 [Figure 12: see original paper], comparing the strength distribution between valid open licensing patents and revoked open licensing patents reveals that revoked patents are generally fewer in the low- and medium-strength range (0-60 points) and relatively more in the high- and medium-strength range (60-100 points), especially 4% and 6% higher in the 60-70 and 70-80 high-strength ranges respectively. Clearly, revoked open licensing patents have overall higher quality, with more high-quality patents. This indicates that patent holders do register some technologically important but market-value-uncertain patents for open licensing, waiting for opportunities to revoke them, confirming theoretical predictions about the revocation system.

4.2 Quality Comparison Between Open Licensing and Non-Open Licensing Patents in the UK

4.2.1 Overall Quality Comparison Given the large number of patents authorized in the UK and the time lag in open licensing registration, this paper selects two time cross-sections (2000 and 2005) to compare quality differences between open licensing and non-open licensing patents among UK-authorized patents. As shown in Figure 13 [Figure 13: see original paper], for UK-authorized patents in 2000 and 2005, the strength distribution between open licensing and non-open licensing patents is generally comparable. This shows that overall, UK-registered open licensing patents are not all low-quality, and speculation that patent holders use the half-price renewal fee policy to maintain low-quality patents cannot stand.

4.2.2 Quality Comparison by Patent Holder At the individual level, the top 20 patent holders show polarized enthusiasm in utilizing the open licensing system. However, comparing the strength distribution between their open licensing patents and other valid patents reveals that for most enterprises, the strength distribution of these two categories is generally comparable, such as

active users like Toyota and less active users like Panasonic (see Figure 14 [Figure 14: see original paper]). This suggests that most enterprises may register patents they do not use for open licensing, with selection criteria unrelated to patent quality—consistent with Japanese interview survey results [9]. Registering unused patents for open licensing may reflect a desire to implement licensing, but the main purpose is likely reducing renewal fees, especially for active users with large patent portfolios. Therefore, the theoretical prediction that patent holders will not open-license core patents is not supported. Meanwhile, two less active users, NCR and Pioneer, are different: the strength of their valid open licensing patents is even higher than their other valid patents, mainly manifested in a higher proportion of high-quality patents, indicating that a few enterprises may adopt a trial attitude, using important patents to seek licensing revenue through the open licensing platform.

4.3 Standard Patents in UK Open Licensing Patents The licensing of standard patents follows the FRAND (Fair, Reasonable, and Non-Discriminatory) principle, which aligns well with the non-refusal nature of open licensing. Therefore, theoretically, the open licensing system should be attractive to standard patents. Using Innography for retrieval reveals a small number of 3G standard patents among UK open licensing patents. Among valid open licensing patents, there are 12 standard patents with an average strength of 57 points, including 6 by Sony, 4 by Philips, 1 by Wireless Network Technology Company, and 1 co-owned by Wireless Network Technology and Sony. Among revoked open licensing patents, there are 25 standard patents with an average strength of 32 points, including 13 by Mitsubishi, 9 by Technicolor, and 3 by BlackBerry. Clearly, not many standard patents are registered for open licensing, and the standard fields are singular. Valid open licensing standard patents have relatively high overall quality. Although the number of standard patents is small, they signal that the open licensing system has some appeal for standard patents. It is worth considering why patent holders register standard patents for open licensing and subsequently revoke them. Is it because open licensing has too many restrictions and is not conducive to standard patent licensing? These questions require further research.

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5. Conclusions and Implications

Based on the above analysis, the implementation status of the UK' s open licensing system can be summarized as follows:

(1) **The overall appeal of the open licensing system is limited.** Although utilization enthusiasm is continuously increasing—for example, the time from grant to open licensing registration has shortened to within 1 year for most patents, and new large enterprises have begun to participate—the overall registration quantity is limited, with an average annual registration of only 1,364. Open licensing patents account for only 2.0%

of authorized patents, and valid open licensing patents account for only 1.4% of valid patents. Moreover, actual licensing is very limited, making even half-price renewal fees unsustainable. Clearly, open licensing is only a supplementary licensing model in the UK with low utilization. The fundamental reason may be that the non-refusal nature of open licensing weakens patent monopolies, dampening enthusiasm for both patent holders and users.

(2) **Utilization enthusiasm varies significantly.** Foreign large enterprises show high enthusiasm, with the top 20 enterprises in valid open licensing patents (mainly from Japan and the US) cumulatively accounting for 92%. They are skilled in IP strategy, familiar with the open licensing system, and register open licenses quickly after grant for their globally laid-out patents, with some even registering the vast majority of their patents. This clearly reflects large enterprises' strategic considerations of reducing renewal fees and extending patent lifespans. Surprisingly, universities show very little enthusiasm, with only 11 universities registering 16 open licensing patents, mostly foreign universities. According to surveys, UK universities actively seek licensing targets early on and prefer exclusive licensing, so they hardly use the open licensing system. Therefore, the annual fee discount may indeed cause unfairness, benefiting large enterprises more.

(3) **Applicable technological fields are limited.** UK open licensing patents concentrate in the automotive and computer software fields, perhaps because these fields have high patent density and are suitable for non-exclusive licensing, i.e., open licensing.

(4) **The quality of open licensing patents is not low.** First, for UK-authorized patents, there is no quality difference between open licensing and non-open licensing patents. Second, valid open licensing patents include some high-quality patents and generally have high market value: high-strength patents account for 9%, patents cited more than 5 times account for 11%, the average simple patent family size is 11, and 99% of patents have more than 3 simple patent families. The reasons may be: first, system users concentrate among a few multinational enterprises that, based on global patent layout strategies, have relatively high overall patent quality and market value; second, large enterprises may register patents they do not use for open licensing, with selection criteria unrelated to patent quality, and some may even use important patents to try to obtain licensing revenue; third, the relatively free revocation system also attracts enterprises to register technologically important but market-value-uncertain patents; fourth, the system has also attracted a small number of standard patents.

(5) **The open licensing system has not encouraged patent infringement.** Restrictions on injunctive relief in infringement remedies allow users to "board first and pay later," making it more convenient for users

to obtain licenses and reducing infringement risk. Consequently, open licensing patents have not been "held up."

Based on these findings, the enlightenment is: The role of the patent open licensing system in promoting licensing transactions is limited, and expecting it to significantly improve implementation rates is unrealistic—it is merely an optional licensing model. The key to achieving the system' s goals lies in two aspects: incentivizing patent holders to offer patents for licensing and incentivizing users to purchase licenses. Considering China' s actual situation, we recommend the following improvements to China' s open licensing system:

Incentivizing Patent Holders:

First is the annual fee discount issue. The UK' s practice of halving fees does increase appeal, and many countries have followed suit. However, it mainly attracts foreign large enterprises who actively use this policy to reduce renewal fee burdens and extend patent lifecycles, leading to unfairness toward SMEs and even the public. China' s invention patents start calculating renewal fees from the third year, with a total of 80,500 RMB payable until expiration; UK patents start from the fifth year, with a total of 4,640 GBP (approximately 40,743 RMB) payable until expiration. China' s total renewal fees are nearly double the UK' s. If halved, the resulting unfairness could be more severe. Chinese legislators initially refused to introduce the annual fee discount policy but reintroduced it after careful consideration, though without specifying concrete discount rules. To seek balance, the design of the annual fee discount policy must be skillful, considering decreasing discounts, attaching licensing conditions, or setting different discount rates for different entities.

Second, the relatively free revocation system is worth referencing because it attracts patent holders to register technologically important but market-value-uncertain patents for open licensing.

Finally, the open licensing system may have appeal for Chinese universities. UK universities do not use the open licensing system because they have strong market awareness. In contrast, Chinese universities currently have large patent stocks with many advanced technologies, but their market awareness is relatively weak and patent operation capabilities are limited. Therefore, Chinese universities may show high enthusiasm for using the open licensing system, and pilot programs could even start with universities [28].

Incentivizing Users:

First is the licensing fee issue. While low-cost, simple, and efficient licensing models attract users, transparency is also essential. After all, patent technology is highly complex, and its value varies significantly. The UK' s licensing fee negotiation system is worth referencing. China' s fourth Patent Law amendment draft initially required explicit licensing fees when declaring open licensing, which was too rigid and might reduce system appeal. The later addition of a negotiation system is commendable. However, complete freedom for patent

holders to choose might be better—for example, allowing pre-pricing, providing reference prices, or negotiation. Some scholars worry that administrative adjudication when fee negotiations fail would lead to excessive administrative intervention and even increase administrative and judicial costs. Based on UK practical experience, there has been only one case in 100 years (the 1971 Cassou patent case) requesting administrative adjudication of licensing fees, so open licensing does not mean endless disputes. Second, restricting injunctive relief in infringement remedies has not encouraged infringement. If users can easily obtain licenses, infringement may even decrease. This is another benefit of the open licensing system.

Other Aspects: First, there is no need to overly worry about the quality of open licensing patents. As long as a certain renewal fee burden is maintained and economic levers are used properly, patent quality will not be too low. It should also be recognized that some are willing to use important patents to implement licensing for profit. Second, the open licensing system has some appeal for standard patents. The relationship between open licensing and standard patents can be further studied to use open licensing to break standard patent licensing barriers [29].

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Author Contributions

Wan Xiaoli: Research design, research guidance, writing and revision;
Feng Binghao: Data retrieval and analysis, revision;
Zhang Yahong: Data retrieval and analysis, revision;
Yu Jiaqi: Literature retrieval, systematic review, revision.

Note: Figure translations are in progress. See original paper for figures.