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A Study on Patents Invalidation Reexamination Decisions for Discussing Variance between Strong Utility Models and Weak Utility Models

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Abstract

19,082 China utility model patents were retrieved from invalidation reexaminations decisions. A thorough analysis using ANOVA was conducted across nine technology areas for discussing the variances between weak utility models, in any of which all claims were invalid through the reexaminations, and strong utility models, in any of which at least one claim was remaining valid. Four high value indicators for classifying utility models were found, including description word count, examination duration, figure count and claim count, to respectively show significance in five technology areas; wherein the strong patents showed significantly higher means of indicators in every technology areas of significance. Two fair value indicators for classification were found, including IPC count and abstract word count, to respectively show significance in three technology areas. Two low value indicators for classification were found, including inventor count and applicant count, showing significance in two or less technology areas. Technology distinction was shown. The overall technology and technology G (physics) were respectively provided with the most number of five valuable indicators, while technology C (chemistry and metallurgy) and D (textiles; paper) were respectively provided with the least number of three valuable indicators. The technologies provided with more valuable indicators were more applicable for classifying strong/weak utility models. The strong utility models were shown to be provided with more claim terms, more figures, richer description content and longer examination duration. The criteria for classification was therefore obtained.

JEL classification: C38, C46, G11, G12.

Keywords: Patent, ANOVA, Utility Model, Reexamination, Invalidation.

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1. Introduction

Patent is the most important outcome of innovation. China, showing outstanding technology capability, has been the largest domestic patent application country in the world for many years. China Intellectual Property Administration (CNIPA) is now the world's largest patent office. By the end of 2022, there have been more than 23 million accumulated grant patents by CNIPA.

With such huge amount of China patents, Li (2012) found that China patent subsidy programs induced an increase in patent propensity and the patent grant ratio increased after the implementation of subsidy programs. Dang and Motohashi (2015) proposed that China patent statistics are meaningful indicators because China valid patent count is correlated with R&D input and financial output.

When quantity achieved, quality and value is then more important. It has been a critical issue to find the indicator capable for identifying good patents, high quality patents, valuable patents, or strong patents. Allison et al. (2004) examined the relationships between asymmetric litigation on patent-value and indicated that patent disputes often involved higher values. After studying indicators on 813 European patents, Reitzi (2004) discovered that the qualified word counts could contribute to patent validity. Zeebroeck (2007) confirmed the confusions related to patent value and patent indicators in respect of forward citations, patent families, issued decisions, patent oppositions and patent renewals.

Boeing and Mueller (2019) proposed a patent quality index based on internationally comparable citation data from international search reports (ISR) to consider foreign, domestic, and self citations. They found that all three citation types may be used as economic indicators if policy distortion is not a concern.

Tsai, Che, & Bai (2021a) defined the technology variety by the number of International Patent Classifications and found that the Chinese A-shares having patents of the higher technology variety showed higher stock return rates. Tsai, Che, and Bai (2021b) further found that Chinese A-shares having invention grant patents of the longer examination duration showed higher stock return rates. Chen, Chu, Che, Tsai & Bai (2022) found that Chinese A-shares in the highest total drawing count groups of invention grant patents showed significantly higher stock return rates while the A-shares in the lower total drawing count groups showed significantly lower stock return rates. Chen, Chu, Che & Tsai (2022) further found that Chinese A-shares in the highest total drawing count groups of utility model patents showed significantly higher stock return rates while the A-shares in the lower total drawing count groups showed significantly lower stock return rates. Tsai, Che & Bai (2022) found that China invention patents with longer patent lives might be regarded as the patents of higher value whereas China utility model patents with longer patent lives might not be regarded as the patents of higher value because of poor significance. Tsai and Che (2022) discussed the industry difference on patent drawings of China invention publications and utility model patents over nine non-manufacturing industry sectors in China stock market. They found that the invention publication's drawing count showed well capability for one industry sector but ineffective capability for three industry sectors; whereas the utility model's drawing count did not show well capability for any industry sectors.

The invalidation reexamination patent database is another important valuable patent source. Patent invalidation reexamination is a challenge to the legality of granted patents, aimed at correcting possible erroneous patent issuing. Any entity or individual who believes that a granted patent does not meet the issuing conditions may request the patent reexamination department to declare the patent invalid. This ensures the accuracy and fairness of the patent system, and maintains fair competition in the market. The patents involved in invalidation reexamination could be regarded as high value patents because patent invalidation reexamination events usually accompanied with patent infringement lawsuits which impact on commercial merits. Galasso & Schankerman (2015) based on patent litigation at the U.S. Court of Appeals for the Federal Circuit, found that patent invalidation caused the patent holder to reduce subsequent patenting and the impact was large for small and medium-sized firms. Han, Zhu, Lei & Daim (2021) outlined a framework for mining industry level R&D trends from patents of patent applications and invalidated patents, then proposed a richer and more comprehensive analysis covering the full lifespan.

However, the characteristics of indicators of patents involved in invalidation reexamination is not yet discussed, especially for indicator variance between strong patents which survived from the invalidation reexaminations and weak patents which failed in the invalidation reexaminations. It is therefore the objective of this research to explore the aforementioned characteristics.

The managerial implication of this research comprises:

1. Enriching the understanding of China patents involved in invalidation reexaminations, especially for China utility model patents;
2. Developing criteria for classifying strong patents and weak patents based on invalidation reexamined utility model patents; and
3. Helping patent owners improve their patent asset management strategy.

In the following paragraphs, section 2 presents the data and methodology including the delimitation and limitation, population and sample, the patent indicators defined and analyzed, and the principal of analysis of variance (ANOVA); section 3 presents the result and finding; section 4 presents the conclusion and recommendation.

2. Data and Methodology

2.1 Delimitation and Limitation

The objective of this research is to explore the valuable patent indicators from the invalidation reexamined patents in the database of the reexamination and invalidation department of China Intellectual Property Administration (CNIPA), therefore, only China patents which received the final invalidation reexamination decisions are discussed.

Regarding the patent species, there are three issued patent species in China patent system including the invention, the utility model and the design. The design patent is a design application of a product which issued by overcoming the preliminary examination by having a distinct configuration, distinct surface ornamentation or both. The utility model is a utility model application of a product which issued by overcoming the preliminary examination. The invention patent is an issued invention application which overcoming not only the preliminary examination but also the substantial examination by having novel and distinct technical features over the prior arts. Though the invention in China is always regarded as the most valuable patent species, however, the utility model occupies the majority of all China patents and highly relates to livelihood industries and traditional industries. It is therefore only the utility models are discussed in this research.

2.2 Population and Sample

The population is the China patents which received the final decisions of invalidation reexamination from the reexamination and invalidation department of China Intellectual Property Administration (CNIPA). Considering the patent database integrity, finally 19,082 China utility model patent samples are collected of which the final decisions of invalidation reexamination are made in the years from 2000 to 2021.

2.3 Instrumentation

2.3.1 Patent Indicator

There are eight quantitative patent indicators are discussed in this research as below:

1. Applicant count: The "applicant count" is defined as the number of entities who owned the patent application when patent issued no matter the entity is an individual or a company, small or big, domestic or foreign. For example, if a patent is filled by three entities including a company, a university and an individual, the applicant count is 3 though the company might have dozens of employees and the university might have thousands of students and teachers. A patent of higher applicant count usually implies a higher level of collaborative Innovation.
2. Inventor count: The inventor is the natural person who substantially contributes the inventive feature(s) of a patent. The "inventor count" is defined as the number of inventors whose names shown on the

patent certificate. A patent of higher inventor count usually implies a higher level of collective intelligence.

3. IPC count: The International Patent Classification (IPC), established by the Strasbourg Agreement 1971, provides for a hierarchical system of language independent symbols for the classification of invention and utility model patents according to the different areas of technology to which they pertain. A patent is provided with at least one and usually several IPC codes, which specified by the examiner. The first IPC of a patent called the principal IPC indicates the principal technology area that the patent pertained. The "IPC count" is defined as the number of IPC codes shown on the issued patent specification. A patent of higher IPC count implies it pertaining more technology areas.
4. Claim count: The patent claim including independent claim terms (sentences) and dependent claim terms (sentences) defines the scope of patent right. The "claim count" is defined as the number of claim terms comprised in a patent. A patent of higher claim count usually implies to have more rigorous scope of right.
5. Figure count: The "figure count" is defined as the number of figures comprised in a patent specification. According to the patent examination criteria, the embodiment and/or inventive features has to be definitely supported by the figures and the description. A patent of higher figure count usually implies to have more embodiments or inventive features.
6. Description word count: The description provides the detailed illustration of inventive features and the resulting functions. The description word count is defined as the number of words comprised in a patent's description part while the abstract and the claim are excluded, wherein, the unit for calculation is thousand words. A patent of higher description word count usually implies to have more embodiments and inventive features.
7. Abstract word count: The abstract is a clear and concise statement of a patent's technical disclosure. The "abstract word count" is defined as the number of words comprised in a patent's abstract. However, the value of the abstract is barely discussed.
8. Examination duration: A China utility model patent must successfully pass the preliminary examination. Though a patent is not issued immediately when it passed the substantial examination and received the notice of allowance, however for simplification , the "examination duration" is defined as the time spent from the filing date to the issue date, wherein, the unit for calculation is month.

If an indicator is capable of classifying patents into strong and weak groups, it is regarded as a valuable indicator.

2.3.2 Technology Area

It is understood that patents in different technologies are somewhat different in drafting and content though the formats are similar. The indicators of patents in different technologies are also analyzed in this research.

Since IPC is a standard classification system for patents, therefore, IPC is applied in this research for classifying technologies. IPC is provided with a hierarchy structure of five levels including section, class, sub-class, group and sub-group. The section is the highest level of IPC hierarchy structure and divides IPC into eight sections as below:

A: Human necessities
B: Performing operations; transporting
C: Chemistry; metallurgy
D: Textiles; paper
E: Fixed constructions
F: Mechanical engineering; lighting; heating; weapons; blasting
G: Physics
H: Electricity

As described above, the principal IPC indicates the principal technology of a patent, hence all patents in this research are classified to eight technology sections by their principal IPCs. Finally nine technology areas including overall technology and eight technology sections are analyzed.

2.3.3 Patent Group

In the invalidation reexamination decision, there are three types of claim validation decision, including all claims maintaining valid, claims partly remaining valid, and all claims invalid. In this research, two patent groups are therefore defined as below:

Group #S: The patents of which the invalidation reexamination decisions show either all claims maintaining valid or claims partly remaining valid. This group, consisting of strong patents which survived from the invalidation reexamination procedure, is regarded as the strong patent group.

Group #W: The patents of which the invalidation reexamination decisions show all claims invalid. This group, consisting of weak patent which failed in the invalidation reexamination procedure, is regarded as the weak patent group.

2.3.4 Analysis of Variance

Analysis of Variance (ANOVA) is applied in this research for exploring:

Is the variance of indicators between patent groups #W and #S significantly different or not? If yes, such indicator is regarded as the valuable indicator for classifying strong patents and weak patents.

ANOVA is a statistical approach used to compare variances across the means of different data groups. The outcome of ANOVA is the "F-Ratio".

$$F = \frac{MST}{MSE} = \frac{\sum n_j (\overline{x_j} - \overline{x})^2 / (k-1)}{\sum\sum (x - \overline{x_j})^2 / (N-k)} \quad (1)$$

This F-ratio shows the difference between the within group variance and the between group variance, which ultimately produces a result which allowing a conclusion that the null hypothesis H_0: $\mu_1 = \mu_2 = ... = \mu_k$ is supported or rejected. If there is a significant difference between the groups, the null hypothesis is not supported, and the F-ratio will be larger while the corresponding p value should be smaller than 0.05.

3. Result and Finding

3.1 Overall Technology

In 19,082 patent samples, the strong patent group #S comprises 9,852 patents while the weak patent group #W comprises 9,230 patents. Figure 1 shows the annual statistics of patent counts in both patent groups by the invalidation reexamination decision date from 2000 to 2021. Though the patent counts do not steadily increase year by year, the increasing trend has been apparently shown since 20148.

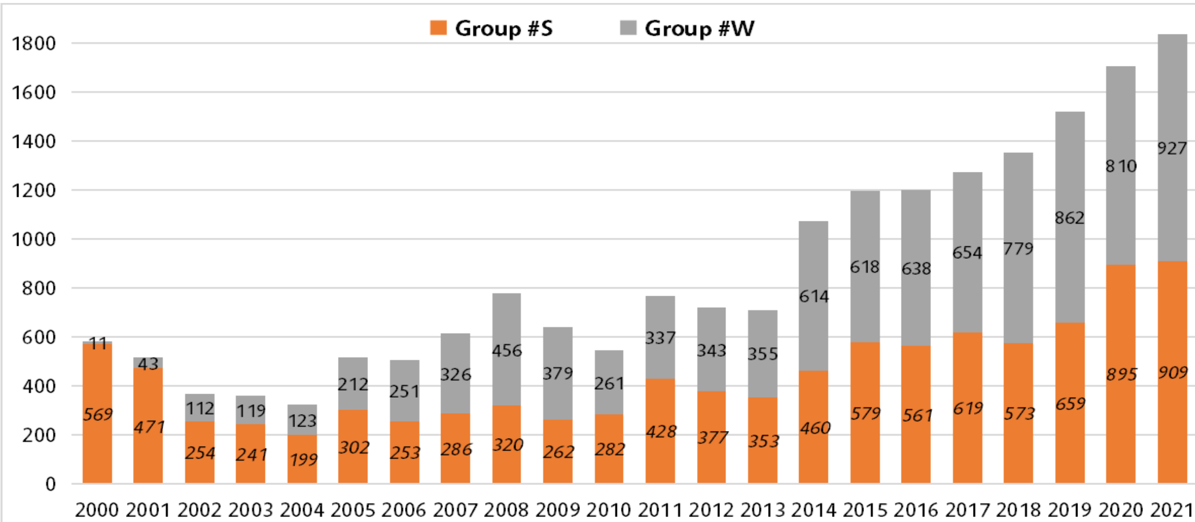

Figure 1: Patent counts from 2000 to 2021

Data Source: Author's Calculation

Figure 2 shows the patent counts in both patent groups in eight technology sections. Technology section B (performing operations; transporting) of 4,845 patents is provided with the highest number of patents, technology section A (human necessities) of 3,791 patents and technology F (mechanical engineering; lighting; heating; weapons; blasting) of 3,223 patents are provided with the higher numbers of patents, while technology section D (textiles; paper) of 470 and technology section C (chemistry; metallurgy) of 532 patents are provided with the lower numbers of patents.

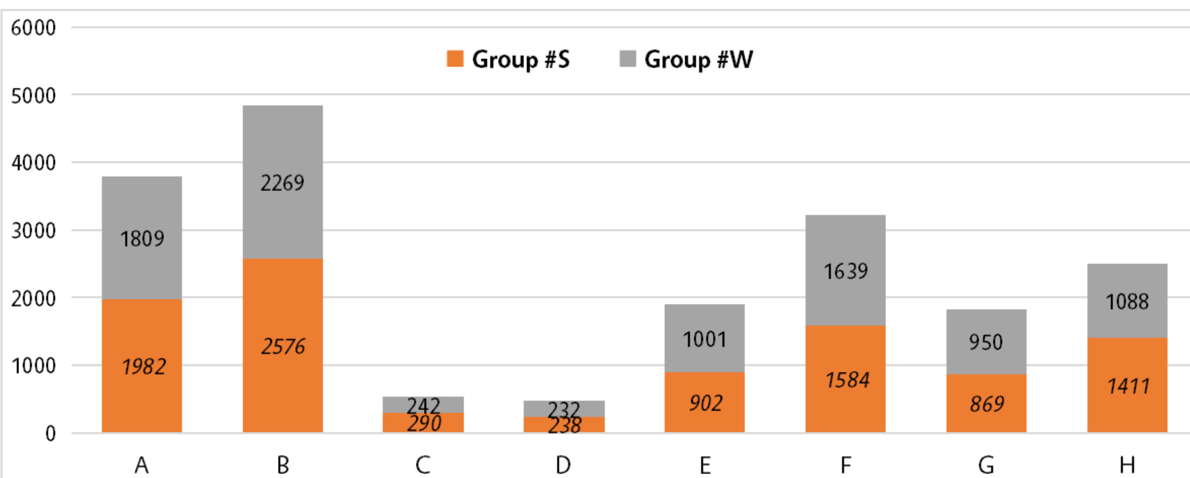

Figure 2: Patent counts in eight technology sections

Data Source: Author's Calculation

Table 1 shows the descriptive statistics of indicators of two patent groups for overall technology. Six indicators including applicant count, inventor count, claim count, figure count, description word count and examination duration, of the strong patent group #S show higher means than those of the weak patent group #W; whereas the other two indicators including IPC count and abstract word count, of the strong patent group #S show lower means.

Table 1: Descriptive statistics of indicators of patent groups for overall technology

Indicator	Group	Patent	Mean	Standard deviation	Standard error
Applicant count	#W	9,230	1.072	0.324	0.003
	#S	9,852	1.080	0.342	0.003
	Total	19,082	1.076	0.334	0.002
Inventor count	#W	9,230	1.854	1.692	0.018
	#S	9,852	1.856	1.612	0.016
	Total	19,082	1.855	1.651	0.012
IPC count	#W	9,230	1.811	1.126	0.012
	#S	9,852	1.752	1.092	0.011
	Total	19,082	1.780	1.109	0.008
Claim count	#W	9,230	5.662	4.569	0.048
	#S	9,852	5.991	4.452	0.045
	Total	19,082	5.832	4.512	0.033
Figure count	#W	9,230	3.969	4.304	0.045
	#S	9,852	4.588	4.481	0.045
	Total	19,082	4.288	4.407	0.032
Description word count	#W	9,230	2.882	2.461	0.026
	#S	9,852	3.297	2.690	0.027
	Total	19,082	3.096	2.590	0.019
Abstract word count	#W	9,230	225.738	59.764	0.622
	#S	9,852	224.618	60.726	0.612
	Total	19,082	225.160	60.264	0.436
Examination duration	#W	9,230	9.331	3.910	0.041
	#S	9,852	10.113	4.539	0.046
	Total	19,082	9.734	4.264	0.031

Data Source: Author’s Calculation

Table 2 shows the results of ANOVA on eight indicators between strong patent group #S and weak patent group #W for overall technology. The variances between two patent groups are of significance for five indicators including IPC count (p***≤0.001), claim count (p***≤0.001), figure count (p***≤0.001), description word count (p***≤0.001) and examination duration (p***≤0.001); whereas the variances between two patent groups are free of significance for the other three indicators including applicant count, inventor count and abstract count. The former five indicators are valuable indicators for overall technology. Based on Tables 1 and 2, the strong patent group #S significantly shows higher claim count, higher figure count, higher description word count and longer examination duration, but lower IPC count than the weak patent group #W.

Table 2: ANOVA on indicators between patent groups for overall technology

Indicator		Sum square	Mean square	F	p
Applicant count	between groups	0.261	0.261	2.346	0.126
	within groups	2,122.643	0.111		
Inventor count	between groups	0.010	0.010	0.004	0.951
	within groups	52,038.207	2.727		
IPC count	between groups	16.833	16.833	13.691	0.001***
	within groups	23,458.571	1.229		
Claim count	between groups	517.774	517.774	25.462	0.001***
	within groups	387,987.572	20.335		
Figure count	between groups	1,828.416	1,828.416	94.597	0.001***
	within groups	368,785.590	19.328		
Description word count	between groups	818.012	818.012	122.713	0.001***
	within groups	127,187.933	6.666		
Abstract word count	between groups	5,975.169	5,975.169	1.645	0.200
	within groups	69,290,413.927	3,631.573		
Examination duration	between groups	2,912.953	2,912.953	161.548	0.001***
	within groups	344,040.814	18.031		

p*<0.05, p**≤0.01, p***≤0.001;
Data Source: Author's Calculation

3.2 ANOVA for technology section A (human necessities)

Table 3 shows the descriptive statistics of eight indicators of two patent groups for technology section A (human necessities). Similar to the descriptive statistics for overall technology, the strong patent group #S shows higher means for six indicators including applicant count, inventor count, claim count, figure count, description word count and examination duration; whereas it shows lower means for the other two indicators including IPC count and abstract word count.

Table 3: Descriptive statistics of indicators of patent groups for technology section A

Indicator	Group	Patent	Mean	Standard deviation	Standard error
Applicant count	#W	1,809	1.056	0.261	0.006
	#S	1,982	1.072	0.303	0.007
	Total	3,791	1.064	0.284	0.005
Inventor count	#W	1,809	1.445	1.099	0.026
	#S	1,982	1.560	1.189	0.027
	Total	3,791	1.505	1.149	0.019
IPC count	#W	1,809	1.689	0.985	0.023
	#S	1,982	1.613	0.920	0.021
	Total	3,791	1.649	0.953	0.015
Claim count	#W	1,809	5.849	3.786	0.089
	#S	1,982	5.915	3.834	0.086
	Total	3,791	5.883	3.811	0.062
Figure count	#W	1,809	4.341	5.992	0.141
	#S	1,982	4.605	4.293	0.096
	Total	3,791	4.479	5.175	0.084
Description word count	#W	1,809	2.710	2.207	0.052
	#S	1,982	3.077	2.398	0.054
	Total	3,791	2.902	2.315	0.038
Abstract word count	#W	1,809	224.005	60.448	1.421
	#S	1,982	220.581	62.171	1.396
	Total	3,791	222.215	61.371	0.997
Examination duration	#W	1,809	9.672	4.200	0.099
	#S	1,982	10.464	4.435	0.100
	Total	3,791	10.086	4.342	0.071

Data Source: Author’s Calculation

Table 4 shows the results of ANOVA on eight indicators between strong patent group #S and weak patent group #W for technology section A (human necessities). The variances between two patent groups are of significance for four indicators including inventor count (p**≤0.01), IPC count (p*<0.05), description word count (p***≤0.001) and examination duration (p***≤0.001); whereas the variances between two patent groups are free of significance for the other four indicators. The former four indicators are valuable indicators for technology section A (human necessities). Based on Tables 3 and 4, the strong patent group #S significantly shows higher inventor count, higher description word count and longer examination duration, but lower IPC count.

Table 4: ANOVA on indicators between patent groups for technology section A

Indicator		Sum square	Mean square	F	p
Applicant count	between groups	0.236	0.236	2.936	0.087
	within groups	305.187	0.081		
Inventor count	between groups	12.408	12.408	9.427	0.002**
	within groups	4,987.252	1.316		
IPC count	between groups	5.429	5.429	5.990	0.014*
	within groups	3,433.966	0.906		
Claim count	between groups	4.208	4.208	0.290	0.590
	within groups	55,040.258	14.526		
Figure count	between groups	66.382	66.382	2.480	0.115
	within groups	101,425.701	26.768		
Description word count	between groups	127.293	127.293	23.887	0.001***
	within groups	20,191.114	5.329		
Abstract word count	between groups	11,089.680	11,089.680	2.946	0.086
	within groups	14,263,477.539	3,764.444		
Examination duration	between groups	594.465	594.465	31.789	0.001***
	within groups	70,855.734	18.700		

p*<0.05, p**≤0.01, p***≤0.001;
Data Source: Author's Calculation

3.3 ANOVA for technology section B (performing operations and transporting)

Table 5 shows the descriptive statistics of eight indicators of two patent groups for technology section B (performing operations and transporting). The strong patent group #S shows higher means for six indicators including applicant count, claim count, figure count, description word count, abstract word count and examination duration; whereas it shows lower means for the other two indicators including inventor count and IPC count.

Table 5: Descriptive statistics of indicators of patent groups for technology section B

Indicator	Group	Patent	Mean	Standard deviation	Standard error
Applicant count	#W	2,269	1.062	0.320	0.007
	#S	2,576	1.072	0.360	0.007
	Total	4,845	1.067	0.342	0.005
Inventor count	#W	2,269	1.887	1.931	0.041
	#S	2,576	1.852	1.680	0.033
	Total	4,845	1.869	1.802	0.026
IPC count	#W	2,269	1.807	1.150	0.024
	#S	2,576	1.750	1.122	0.022
	Total	4,845	1.776	1.135	0.016
Claim count	#W	2,269	5.401	4.333	0.091
	#S	2,576	5.638	3.584	0.071
	Total	4,845	5.527	3.954	0.057
Figure count	#W	2,269	3.734	3.395	0.071
	#S	2,576	4.364	4.326	0.085
	Total	4,845	4.069	3.930	0.056
Description word count	#W	2,269	2.801	2.219	0.047
	#S	2,576	3.138	2.372	0.047
	Total	4,845	2.980	2.308	0.033
Abstract word count	#W	2,269	226.555	59.406	1.247
	#S	2,576	226.679	60.077	1.184
	Total	4,845	226.621	59.758	0.859
Examination duration	#W	2,269	9.442	3.817	0.080
	#S	2,576	9.930	4.544	0.090
	Total	4,845	9.702	4.226	0.061

Data Source: Author’s Calculation

Table 6 shows the results of ANOVA on eight indicators between strong patent group #S and weak patent group #W for technology section B (performing operations and transporting). The variances between two patent groups are of significance for four indicators including claim count (p*<0.05), figure count (p***≤0.001), description word count (p***≤0.001) and examination duration (p***≤0.001); whereas the variances between two patent groups are free of significance for the other four indicators. The former four indicators are valuable indicators for technology section B (performing operations and transporting). Based on Tables 5 and 6, the strong patent group #S significantly shows higher claim count, higher figure count, higher description word count and longer examination duration.

Table 6: ANOVA on indicators between patent groups for technology section B

Indicator		Sum square	Mean square	F	p
Applicant count	between groups	0.122	0.122	1.044	0.307
	within groups	566.808	0.117		
Inventor count	between groups	1.452	1.452	0.447	0.504
	within groups	15,733.061	3.249		
IPC count	between groups	3.854	3.854	2.991	0.084
	within groups	6,241.063	1.289		
Claim count	between groups	68.095	68.095	4.358	0.037*
	within groups	75,669.640	15.625		
Figure count	between groups	478.642	478.642	31.188	0.001***
	within groups	74,325.195	15.347		
Description word count	between groups	137.075	137.075	25.869	0.001***
	within groups	25,661.900	5.299		
Abstract word count	between groups	18.693	18.693	0.005	0.942
	within groups	17,297,967.560	3,571.746		
Examination duration	between groups	287.137	287.137	16.129	0.001***
	within groups	86,218.035	17.803		

p*<0.05, p**≤0.01, p***≤0.001;
Data Source: Author’s Calculation

3.4 ANOVA for technology section C (chemistry and metallurgy)

Table 7 shows the descriptive statistics of eight indicators of two patent groups for technology section C (chemistry and metallurgy). The strong patent group #S shows higher means for only one indicator, i.e. examination duration; whereas it shows lower means for the other seven indicator.

Table 7: Descriptive statistics of indicators of patent groups for technology section C

Indicator	Group	Patent	Mean	Standard deviation	Standard error
Applicant count	#W	242	1.140	0.452	0.029
	#S	290	1.117	0.408	0.024
	Total	532	1.128	0.428	0.019
Inventor count	#W	242	3.302	3.040	0.195
	#S	290	2.672	2.531	0.149
	Total	532	2.959	2.789	0.121
IPC count	#W	242	1.628	1.067	0.069
	#S	290	1.572	0.886	0.052
	Total	532	1.598	0.972	0.042
Claim count	#W	242	5.475	3.106	0.200
	#S	290	5.331	3.455	0.203
	Total	532	5.397	3.298	0.143
Figure count	#W	242	3.380	4.840	0.311
	#S	290	3.214	2.422	0.142
	Total	532	3.289	3.719	0.161
Description word count	#W	242	3.771	6.341	0.408
	#S	290	3.214	2.222	0.130
	Total	532	3.467	4.584	0.199
Abstract word count	#W	242	237.421	57.366	3.688
	#S	290	224.793	58.809	3.453
	Total	532	230.538	58.443	2.534
Examination duration	#W	242	8.669	3.378	0.217
	#S	290	10.283	4.675	0.275
	Total	532	9.549	4.210	0.183

Data Source: Author's Calculation

Table 8 shows the results of ANOVA on eight indicators between strong patent group #S and weak patent group #W for technology section C (chemistry and metallurgy). The variances between two patent groups are of significance for three indicators including inventor count ($p^{**} \leq 0.01$), abstract word count ($p^{*} < 0.05$) and examination duration ($p^{***} \leq 0.001$); whereas the variances between two patent groups are free of significance for the other five indicators.
The former three indicators are valuable indicators for technology section C (chemistry and metallurgy). Based on Tables 7 and 8, the strong patent group #S shows significantly longer examination duration, but lower inventor count and lower description word count.

Table 8: ANOVA on indicators between patent groups for technology section C

Indicator		Sum square	Mean square	F	p
Applicant count	between groups	0.071	0.071	0.389	0.533
	within groups	97.237	0.183		
Inventor count	between groups	52.232	52.232	6.787	0.009**
	within groups	4,078.859	7.696		
IPC count	between groups	0.409	0.409	0.432	0.511
	within groups	501.508	0.946		
Claim count	between groups	2.742	2.742	0.252	0.616
	within groups	5,774.572	10.895		
Figure count	between groups	3.651	3.651	0.264	0.608
	within groups	7,339.770	13.849		
Description word count	between groups	40.836	40.836	1.947	0.163
	within groups	11,115.393	20.972		
Abstract word count	between groups	21,037.654	21,037.654	6.220	0.013*
	within groups	1,792,616.594	3,382.295		
Examination duration	between groups	343.458	343.458	20.079	0.001***
	within groups	9,065.813	17.105		

$p^{*} < 0.05$, $p^{**} \leq 0.01$, $p^{***} \leq 0.001$;
Data Source: Author’s Calculation

3.5 ANOVA for technology section D (textiles and paper)

Table 9 shows the descriptive statistics of eight indicators of two patent groups for technology section D (textiles and paper). The strong patent group #S shows higher means for six indicators including inventor count, claim count, figure count, description word count, abstract word count and examination duration; whereas it shows lower means for the other two indicators including applicant count and IPC count.

Table 9: Descriptive statistics of indicators of patent groups for technology section D

Indicator	Group	Patent	Mean	Standard deviation	Standard error
Applicant count	#W	232	1.125	0.433	0.028
	#S	238	1.092	0.344	0.022
	Total	470	1.109	0.390	0.018
Inventor count	#W	232	2.172	1.808	0.119
	#S	238	2.227	1.788	0.116
	Total	470	2.200	1.796	0.083
IPC count	#W	232	1.621	0.844	0.055
	#S	238	1.618	0.937	0.061
	Total	470	1.619	0.892	0.041
Claim count	#W	232	4.659	2.920	0.192
	#S	238	5.454	5.220	0.338
	Total	470	5.062	4.258	0.196
Figure count	#W	232	3.228	2.879	0.189
	#S	238	3.718	2.791	0.181
	Total	470	3.477	2.842	0.131
Description word count	#W	232	2.348	1.445	0.095
	#S	238	3.109	2.576	0.167
	Total	470	2.733	2.128	0.098
Abstract word count	#W	232	218.509	62.927	4.131
	#S	238	220.752	67.739	4.391
	Total	470	219.645	65.348	3.014
Examination duration	#W	232	9.484	3.637	0.239
	#S	238	10.510	4.446	0.288
	Total	470	10.004	4.095	0.189

Data Source: Author’s Calculation

Table 10 shows the results of ANOVA on eight indicators between strong patent group #S and weak patent group #W for technology section D (textiles and paper). The variances between two patent groups are of significance for three indicators including claim count (p*<0.05), description word count (p***≤0.001) and examination duration (p**≤0.01); whereas the variances between two patent groups are free of significance for the other five indicators. The former three indicators are valuable indicators for technology section D (textiles and paper). Based on Tables 9 and 10, the strong patent group #S shows significantly higher claim count, higher description word count and longer examination duration.

Table 10: ANOVA on indicators between patent groups for technology section D

Indicator		**Sum square**	**Mean square**	**F**	**p**
Applicant count	between groups	0.125	0.125	0.817	0.366
	within groups	71.341	0.152		
Inventor count	between groups	0.349	0.349	0.108	0.743
	within groups	1,512.851	3.233		
IPC count	between groups	0.001	0.001	0.001	0.971
	within groups	372.827	0.797		
Claim count	between groups	74.120	74.120	4.115	0.043*
	within groups	8,429.091	18.011		
Figure count	between groups	28.212	28.212	3.510	0.062
	within groups	3,761.031	8.036		
Description word count	between groups	67.891	67.891	15.456	0.001***
	within groups	2,055.733	4.393		
Abstract word count	between groups	591.305	591.305	0.138	0.710
	within groups	2,002,230.357	4,278.270		
Examination duration	between groups	123.710	123.710	7.478	0.006**
	within groups	7,742.114	16.543		

p*<0.05, p**≤0.01, p***≤0.001;
Data Source: Author’s Calculation

3.6 ANOVA for technology section E (fixed constructions)

Table 11 shows the descriptive statistics of eight indicators of two patent groups for technology section E (fixed constructions). The strong patent group #S shows higher means for five indicators including applicant count, claim count, figure count, description word count and examination duration; whereas it shows lower means for the other three indicators including inventor count, IPC count and abstract count.

Table 11: Descriptive statistics of indicators of patent groups for technology section E

Indicator	Group	Patent	Mean	Standard deviation	Standard error
Applicant count	#W	1,001	1.068	0.282	0.009
	#S	902	1.118	0.434	0.014
	Total	1,903	1.091	0.363	0.008
Inventor count	#W	1,001	1.949	1.829	0.058
	#S	902	1.904	1.845	0.061
	Total	1,903	1.927	1.837	0.042
IPC count	#W	1,001	1.743	1.077	0.034
	#S	902	1.651	1.045	0.035
	Total	1,903	1.699	1.062	0.024
Claim count	#W	1,001	5.313	2.977	0.094
	#S	902	5.506	3.658	0.122
	Total	1,903	5.404	3.318	0.076
Figure count	#W	1,001	3.967	4.473	0.141
	#S	902	4.761	4.770	0.159
	Total	1,903	4.343	4.632	0.106
Description word count	#W	1,001	2.567	1.626	0.051
	#S	902	2.908	2.196	0.073
	Total	1,903	2.729	1.924	0.044
Abstract word count	#W	1,001	225.906	59.286	1.874
	#S	902	223.667	62.174	2.070
	Total	1,903	224.845	60.667	1.391
Examination duration	#W	1,001	9.412	4.018	0.127
	#S	902	10.680	4.764	0.159
	Total	1,903	10.013	4.432	0.102

Data Source: Author's Calculation

Table 12 shows the results of ANOVA on eight indicators between strong patent group #S and weak patent group #W for technology section E (fixed constructions). The variances between two patent groups are of significance for four indicators including applicant count (p**≤0.01), figure count (p***≤0.001), description word count (p***≤0.001) and examination duration (p***≤0.001); whereas the variances between two patent groups are free of significance for the other four indicators. The former four indicators are valuable indicators for technology section E (fixed constructions). Based on Tables 11 and 12, the strong patent group #S shows significantly higher applicant count, higher figure count, higher description word count and longer examination duration.

Table 12: ANOVA on indicators between patent groups for technology section E

Indicator		Sum square	Mean square	F	p
Applicant count	between groups	1.167	1.167	8.909	0.003**
	within groups	248.924	0.131		
Inventor count	between groups	0.982	0.982	0.291	0.590
	within groups	6,415.010	3.375		
IPC count	between groups	4.058	4.058	3.601	0.058
	within groups	2,142.011	1.127		
Claim count	between groups	17.647	17.647	1.604	0.206
	within groups	20,920.601	11.005		
Figure count	between groups	298.741	298.741	14.022	0.001***
	within groups	40,502.187	21.306		
Description word count	between groups	55.074	55.074	14.982	0.001***
	within groups	6,988.269	3.676		
Abstract word count	between groups	2,377.875	2,377.875	0.646	0.422
	within groups	6,997,819.395	3,681.125		
Examination duration	between groups	763.236	763.236	39.650	0.001***
	within groups	36,592.881	19.249		

p*<0.05, p**≤0.01, p***≤0.001;
Data Source: Author's Calculation

3.7 ANOVA for technology section F (mechanical engineering, lighting, heating, weapons and blasting)

Table 13 shows the descriptive statistics of eight indicators of two patent groups for technology section F (mechanical engineering, lighting, heating, weapons and blasting). The strong patent group #S shows higher means for five indicators including inventor count, claim count, figure count, description word count and examination duration; whereas it shows lower means for the other three indicators including applicant count, IPC count and abstract count.

Table 13: Descriptive statistics of indicators of patent groups for technology section F

Indicator	Group	Patent	Mean	Standard deviation	Standard error
Applicant count	#W	1,639	1.085	0.359	0.009
	#S	1,584	1.066	0.313	0.008
	Total	3,223	1.075	0.337	0.006
Inventor count	#W	1,639	1.880	1.608	0.040
	#S	1,584	1.912	1.653	0.042
	Total	3,223	1.895	1.630	0.029
IPC count	#W	1,639	2.049	1.385	0.034
	#S	1,584	1.925	1.326	0.033
	Total	3,223	1.988	1.358	0.024
Claim count	#W	1,639	5.425	3.372	0.083
	#S	1,584	5.673	3.965	0.100
	Total	3,223	5.547	3.677	0.065
Figure count	#W	1,639	3.791	3.869	0.096
	#S	1,584	4.420	4.973	0.125
	Total	3,223	4.100	4.456	0.078
Description word count	#W	1,639	2.631	1.860	0.046
	#S	1,584	3.099	2.639	0.066
	Total	3,223	2.861	2.288	0.040
Abstract word count	#W	1,639	222.564	59.873	1.479
	#S	1,584	221.016	60.984	1.532
	Total	3,223	221.803	60.417	1.064
Examination duration	#W	1,639	9.121	3.867	0.096
	#S	1,584	10.173	4.713	0.118
	Total	3,223	9.638	4.335	0.076

Data Source: Author’s Calculation

Table 14 shows the results of ANOVA on eight indicators between strong patent group #S and weak patent group #W for technology section F (mechanical engineering, lighting, heating, weapons and blasting). The variances between two patent groups are of significance for four indicators including IPC count ($p^{**} \le 0.01$), figure count ($p^{***} \le 0.001$), description word count ($p^{***} \le 0.001$) and examination duration ($p^{***} \le 0.001$); whereas the variances between two patent groups are free of significance for the other four indicators. The former four indicators are valuable indicators for technology section F (mechanical engineering, lighting, heating, weapons and blasting). Based on Tables 13 and 14, the strong patent group #S shows significantly higher figure count, higher description word count and longer examination duration, but lower IPC count.

Table 14: ANOVA on indicators between patent groups for technology section F

Indicator		Sum square	Mean square	F	p
Applicant count	between groups	0.295	0.295	2.597	0.107
	within groups	366.383	0.114		
Inventor count	between groups	0.815	0.815	0.307	0.580
	within groups	8,562.948	2.658		
IPC count	between groups	12.373	12.373	6.725	0.010**
	within groups	5,926.155	1.840		
Claim count	between groups	49.675	49.675	3.677	0.055
	within groups	43,513.048	13.509		
Figure count	between groups	318.793	318.793	16.129	0.001***
	within groups	63,663.037	19.765		
Description word count	between groups	176.663	176.663	34.092	0.001***
	within groups	16,691.280	5.182		
Abstract word count	between groups	1,930.199	1,930.199	0.529	0.467
	within groups	11,759,007.693	3,650.732		
Examination duration	between groups	891.958	891.958	48.157	0.001***
	within groups	59,659.170	18.522		

$p^{*} < 0.05$, $p^{**} \le 0.01$, $p^{***} \le 0.001$;
Data Source: Author's Calculation

3.8 ANOVA for technology section G (physics)

Table 15 shows the descriptive statistics of eight indicators of two patent groups for technology section G (physics). The strong patent group #S shows higher means for six indicators including applicant count, inventor count, claim count, figure count, description word count and examination duration; whereas it shows lower means for the other two indicators including IPC count and abstract word count.

Table 15: Descriptive statistics of indicators of patent groups for technology section G

Indicator	Group	Patent	Mean	Standard deviation	Standard error
Applicant count	#W	950	1.056	0.283	0.009
	#S	869	1.064	0.312	0.011
	Total	1,819	1.060	0.297	0.007
Inventor count	#W	950	1.997	1.593	0.052
	#S	869	2.000	1.671	0.057
	Total	1,819	1.998	1.630	0.038
IPC count	#W	950	1.607	0.862	0.028
	#S	869	1.583	0.871	0.030
	Total	1,819	1.596	0.866	0.020
Claim count	#W	950	6.597	6.315	0.205
	#S	869	7.337	7.130	0.242
	Total	1,819	6.951	6.725	0.158
Figure count	#W	950	4.067	3.533	0.115
	#S	869	4.835	3.748	0.127
	Total	1,819	4.434	3.657	0.086
Description word count	#W	950	3.742	3.025	0.098
	#S	869	4.336	3.590	0.122
	Total	1,819	4.026	3.319	0.078
Abstract word count	#W	950	234.356	58.617	1.902
	#S	869	228.904	59.353	2.013
	Total	1,819	231.752	59.016	1.384
Examination duration	#W	950	8.917	3.832	0.124
	#S	869	9.933	4.462	0.151
	Total	1,819	9.402	4.175	0.098

Data Source: Author’s Calculation

Table 16 shows the results of ANOVA on eight indicators between strong patent group #S and weak patent group #W for technology section G (Physics). The variances between two patent groups are of significance for five indicators including claim count (p*<0.05), figure count (p***≤0.001), description word count (p***≤0.001), abstract word count (p*<0.05) and examination duration (p***≤0.001); whereas the variances between two patent groups are free of significance for the other three indicators. The former five indicators are valuable indicators for technology section G (Physics). Based on Tables 15 and 16, the strong patent group #S shows significantly higher claim count, higher figure count, higher description word count and longer examination duration, but lower abstract word count.

Table 16: ANOVA on indicators between patent groups for technology section G

Indicator		Sum square	Mean square	F	p
Applicant count	between groups	0.034	0.034	0.385	0.535
	within groups	160.434	0.088		
Inventor count	between groups	0.005	0.005	0.002	0.967
	within groups	4,832.991	2.660		
IPC count	between groups	0.260	0.260	0.347	0.556
	within groups	1,363.750	0.751		
Claim count	between groups	248.747	248.747	5.513	0.019*
	within groups	81,982.800	45.120		
Figure count	between groups	267.743	267.743	20.236	0.001***
	within groups	24,041.157	13.231		
Description word count	between groups	160.490	160.490	14.675	0.001***
	within groups	19,871.234	10.936		
Abstract word count	between groups	13,486.868	13,486.868	3.878	0.049*
	within groups	6,318,410.816	3,477.386		
Examination duration	between groups	468.337	468.337	27.263	0.001***
	within groups	31,213.582	17.179		

p*<0.05, p**≤0.01, p***≤0.001;
Data Source: Author’s Calculation

3.9 ANOVA for technology section H (electricity)

Table 17 shows the descriptive statistics of eight indicators of two patent groups for technology section H (electricity). The strong patent group #S shows higher means for five indicators including inventor count, claim count, description word count, abstract word count and examination duration; whereas it shows lower means for the other three indicators including applicant count, IPC count and figure count for technology section H (electricity).

Table 17: Descriptive statistics of indicators of patent groups for technology section H

Indicator	Group	Patent	Mean	Standard deviation	Standard error
Applicant count	#W	1,088	1.096	0.372	0.011
	#S	1,411	1.097	0.326	0.009
	Total	2,499	1.096	0.346	0.007
Inventor count	#W	1,088	1.828	1.337	0.041
	#S	1,411	1.867	1.379	0.037
	Total	2,499	1.850	1.361	0.027
IPC count	#W	1,088	1.988	1.090	0.033
	#S	1,411	1.983	1.118	0.030
	Total	2,499	1.985	1.106	0.022
Claim count	#W	1,088	6.012	6.978	0.212
	#S	1,411	6.808	5.238	0.139
	Total	2,499	6.461	6.068	0.121
Figure count	#W	1,088	4.311	3.745	0.114
	#S	1,411	5.327	5.050	0.134
	Total	2,499	4.885	4.555	0.091
Description word count	#W	1,088	3.174	2.617	0.079
	#S	1,411	3.774	3.175	0.085
	Total	2,499	3.513	2.960	0.059
Abstract word count	#W	1,088	222.959	59.520	1.804
	#S	1,411	229.153	58.025	1.545
	Total	2,499	226.456	58.749	1.175
Examination duration	#W	1,088	9.249	3.742	0.113
	#S	1,411	9.529	4.269	0.114
	Total	2,499	9.407	4.049	0.081

Data Source: Author’s Calculation

Table 18 shows the results of ANOVA on eight indicators between strong patent group #S and weak patent group #W for technology section H (Electricity). The variances between two patent groups are of significance for four indicators including claim count (p***≤0.001), figure count (p***≤0.001), description word count (p***≤0.001) and abstract word count (p**≤0.01); whereas the variances between two patent groups are free of significance for the other four indicators. The former four indicators are valuable indicators for technology section H (Electricity). Based on Tables 17 and 18, the strong patent group #S significantly shows higher claim count, higher figure count, higher description word count and higher abstract word count.

Table 18: ANOVA on indicators between patent groups for technology section H

Indicator		Sum square	Mean square	F	p
Applicant count	between groups	0.001	0.001	0.012	0.914
	within groups	299.757	0.120		
Inventor count	between groups	0.917	0.917	0.495	0.482
	within groups	4,623.810	1.852		
IPC count	between groups	0.016	0.016	0.013	0.910
	within groups	3,054.436	1.223		
Claim count	between groups	389.228	389.228	10.610	0.001***
	within groups	91,603.796	36.686		
Figure count	between groups	635.084	635.084	30.973	0.001***
	within groups	51,199.725	20.504		
Description word count	between groups	221.232	221.232	25.503	0.001***
	within groups	21,660.989	8.675		
Abstract word count	between groups	23,571.879	23,571.879	6.846	0.009**
	within groups	8,598,104.073	3,443.374		
Examination duration	between groups	48.367	48.367	2.952	0.086
	within groups	40,912.844	16.385		

p*<0.05, p**≤0.01, p***≤0.001; Data Source: Author's Calculation

3.10 Summary

By defining the valuable indicator as the indicator of which the variance between patent groups #S and #W is of significance, Table 19 shows the valuable indicators in nine technology areas including overall technology and eight technology sections. There are two valuable indicators including description word count and examination duration respectively showing significance in eight technology areas including seven technology sections and overall technology. There is one valuable indicator, i.e. figure count, showing significance in six technology areas including five technology sections and overall technology. There is one valuable indicator, i.e. claim count, showing significance in five technology areas including four technology sections and overall technology. The aforementioned four valuable indicators are regarded as high value indicators for classifying strong patents and weak patents.

There are two valuable indicators including IPC count and abstract word count, respectively showing significance in three technology areas. These two valuable indicators are regarded as fair value indicators for classification. There is one valuable indicator of inventor count showing significance in two technology areas while there is one valuable indicator of applicant count showing significance in only one technology area. These two valuable indicators are regarded as low value indicators for classification.

Table 19: Indicator means of significance in nine technology areas

Means of significance										
Technology		overall	A	B	C	D	E	F	G	H
Applicant count	#W						1.068			
	#S						1.118			
Inventor count	#W		1.445		3.302					
	#S		1.560		2.672					
IPC count	#W	1.811	1.689					2.049		
	#S	1.752	1.613					1.925		
Claim count	#W	5.662		5.401		4.659			6.597	6.012
	#S	5.991		5.638		5.454			7.337	6.808
Figure count	#W	3.969		3.734			3.967	3.791	4.067	4.311
	#S	4.588		4.364			4.761	4.420	4.835	5.327
Description word count	#W	2.882	2.710	2.801		2.348	2.567	2.631	3.742	3.174
	#S	3.297	3.077	3.138		3.109	2.908	3.099	4.336	3.774
Abstract word count	#W				237.421				234.356	222.959
	#S				224.793				228.904	229.153
Examination duration	#W	9.331	9.672	9.442	8.669	9.484	9.412	9.121	8.917	
	#S	10.113	10.464	9.930	10.283	10.510	10.680	10.173	9.933	

Data Source: Author's Calculation

As summarized in Table 19, the overall technology and technology section G (physics) are the technology areas respectively provided with the most number of valuable indicators, i.e. five, while technology sections C (chemistry and metallurgy) and D (textiles; paper) are the technology areas respectively provided with the least number of valuable indicators, i.e. three. The other five technology areas including technology sections A (human necessities), B (performing operations; transporting), E (fixed constructions), F (mechanical engineering; lighting; heating; weapons; blasting) and H (electricity) are respectively provided with four valuable indicators. It means that it would be easier and more accurate to classify strong and weak patents in aforementioned seven technology areas because there are at least four valuable indicators could be applied for classification. However, it would be more difficult and inaccurate to classify strong and weak patents in technology sections C (chemistry and metallurgy) and D (textiles; paper) because there are only two valuable indicators could be applied for classification.

There are 72 cells in the matrix formed by 9 technology areas * 8 indicators as shown in Table 19, wherein, 36 cells are provided with valuable indicators. It is noted that the high value indicators of description word count, examination duration, claim count and figure count, respectively show significantly higher means for the strong patent group #S in technology areas of significance.

However, the strong patent group #S does not always show higher means in these 36 cells, while there are six cells in which the strong patent group #S shows lower means. For low value indicator of inventor count in technology section C (chemistry and metallurgy), for fair value indicator of IPC count in overall technology, technology sections A (human necessities) and F (mechanical engineering; lighting; heating; weapons; blasting), for fair value indicator of abstract word count in technology sections C (chemistry and metallurgy) and G (physics), the strong patent group #S shows significantly lower means.

4. Conclusion and Recommendation

Based on 19,082 invalidation reexamined China utility model patents, eight indicators and nine technology areas, the effect and value of indicators for classifying strong patents, i.e. group #S, and weak patents, i.e. group #W, was thoroughly analyzed via ANOVA. Valuable indicators which showing variances of significance between patent groups for classification were successfully found.

19,082 invalidation reexamined China utility model patents were of the invalidation reexamination decision dates from 2000 to 2001. Eight indicators consisted of applicant count, inventor count, IPC count, claim count, figure count, description word count, abstract word count, and examination duration. Nine technology areas comprised overall technology and eight technology sections, which classified by the principal IPC, including A (human necessities), B (performing operations; transporting), C (chemistry; metallurgy), D (textiles; paper), E (fixed constructions), F (mechanical engineering; lighting; heating; weapons; blasting), G (physics), and H (electricity).

The following conclusions were arrived:

1. Four high value indicators including description word count, examination duration, figure count and claim count were found for classifying strong patents and weak patents. These four high indicators respectively showed significance in at least five technology areas.
2. Two fair value indicators including IPC count and abstract word count for classification were found. These two fair indicators respectively showed significance in three technology areas.
3. Two low value indicators including inventor count and applicant count were found for classification. Inventor count showed significance in two technology sections while applicant count showed significance in only one technology section.
4. Technology issue was proved to be sensitive for applying indicator for classification. The overall technology and technology section G (physics) were respectively provided with the most number of valuable indicators, i.e. five; while technology sections C (chemistry and metallurgy) and D (textiles; paper) were respectively provided with the least number of valuable indicators, i.e. three. The other five technology sections were provided with four valuable indicators. It meant that it would be much easier and more accurate to classify strong and weak patents in overall technology and technology section G (physics) by applying valuable indicators, whereas it would be more difficult and inaccurate to classify in technology sections C (chemistry and metallurgy) and D (textiles; paper).
5. For four high value indicators of description word count, examination duration, claim count and figure count, the strong patents showed significantly higher means in every technology areas of significance.
6. In 72 cells of the matrix formed by 9 technology areas * 8 indicators, there were 36 cells in which valuable indicators showed significant variances between strong and weak patents. The strong patents did not showed significantly higher indicator means in all 36 cells. There were six cells in which the strong patents showing significantly lower indicator means. For low value indicator of inventor count in technology section C (chemistry and metallurgy), for fair value indicator of IPC count in overall technology, technology sections A (human necessities) and F (mechanical engineering; lighting; heating; weapons; blasting), for fair value indicator of abstract word count in technology sections C (chemistry and metallurgy) and G (physics), the strong patents showed significantly lower means.
7. In practice, the claim is regarded as the most important part of a patent to form the scope of right, while the figure and the description reflect the text quality of a patent. This research illustrated that a stronger utility model patent might be identified by more claim terms, more figures and richer description content.

The required patentability test for China utility model patent is the preliminary examination which involving the novelty test but regardless of the nonobviousness test. The preliminary examination of a utility model patent is therefore fast and the examination duration is usually shorter. It is interesting to find in this research that the strong utility model patents were also provided with significantly longer examination duration than the weak utility model patents though it is hard to understand why the strong utility model patents spending longer time for preliminary examination.

Since the invalidation reexamined patents have been already recognized as the high value patents, the finding of this research proposed an approach for systematically finding and testing the indicators for classifying strong patents and weak patents among high value utility model patents. The finding will contribute the state of art in evaluating patents and help patent applicants and owners improve their patent asset management policy. According to the proposed approach, the patent asset management may be efficiently improved. Patent owners are able to quickly classify their huge amount of utility model patents into strong patents and weak patents via different technology perspectives. The strong patents might be suitable for annual fee maintaining and stick licensing; while the weak patents might be suitable for soft licensing and transaction. The patent applicants and attorneys are also suggested to apply the significantly higher or lower means of valuable indicators to draft a stronger utility model application in the beginning. It may improve the patent utilization when the patent application is issued.

The related researchers are also encouraged to proceed the future works for consummating the patent evaluation art including:

1. Applying the proposed approach on other patent species and/or patents in other countries;
2. Applying the proposed approach on other indicators for enriching more valuable indicators for classification, such as backward citations and forward citations;
3. Applying the proposed approach on all-claims-maintaining-valid patents and claims-partly-remaining-valid patents to see the variance of significance between these two kind of strong patents; and
4. Applying the proposed approach on reexamined patents and non-reexamined patents to see the variance of significance between high value patents and ordinary patents and find the corresponding valuable indicators.

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