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Statistical Analysis and Measurements of Patent Quality Indicators Within Semantically Defined Homogeneous Control Groups

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A WORKING PAPER

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[2] A conference on Improving Patent Quality co-sponsored by IBM and Royal Society for the encouragement of Arts, Manufactures and Commerce (RSA), United States, November 7, at Columbia University, New York. Keynote presenters: Andy Gibbs, CEO of PatentCafe®; Professor Ronald J. Mann, Co-Chair, Charles E. Gerber Transactional Studies Program of Columbia Law School; and Professor Toshiya Watanabe, Research Center for Advanced Science and Technology, the University of Tokyo.

Abstract

As patents become increasingly important as capital assets, there is an increasingly urgent drive to identify indicators of intrinsic value. In traditional capital markets, an underlying basis exists to which buyers and sellers can agree to a certain asset value. While these capital markets are built on a market-driven value of various classes of commodities, patents, by their very nature, are exclusive, and have no statutory equal. Each patent is an exclusive property.

Although there have been attempts to compute the economic value of a patent asset, the author believes that economic value is a negotiated, market-driven price point agreed to by a buyer and seller (or licensor and licensee), and therefore lies outside the scope of this analysis.

This paper explores various computed indicators of patent value, and attempts to identify measurable metrics that correlate to value.

The most fundamental quality metric for patents is a determination of its reliability as an enduring asset based on its validity or invalidity. In each analysis, the baseline data set will be patents adjudged in a court of competent jurisdiction. Each analysis assumes the veracity of the validity or invalidity determination by the court, and explores indicators correlating to the courts' decisions which may be used as a predictive model applied to the larger data set of patents. The landmark cases *in re KSR,* and *in re Bilski* for instance, can immediately alter the test for validity, and therefore the indicators of patent survivability and value. Non-obviousness is generally accepted as the equivalent patentability requirement to the European "inventive step".

Other metrics relating to commercial, legal and technological values are explored, and those indices that are shown to correlate positively to qualitative metrics.

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Dr. Joseph E. Cater, III

Third party modeling was performed by Dr. Joseph E. Cater, III, Chief Economist and President of Market-Economics. Dr. Cater has fifteen years of economic and financial marketing experience including work at the county, state, and federal levels, as well as for the private sector levels. Most recently, Director of Regional Economics at Fannie Mae providing economic and housing market reports for the CEO and senior company officials. Dr. Cater has a Ph.D. in Economics and MBA in Management. Market-Economics.com

Dr. Richard Pocklington

Dr. Pocklington performed a large-scale patent data analysis on PatentCafe's Latent Semantic Analysis patent search engine to determine the optimum number of documents comprising a technology sphere for reliable analysis of qualitative legal and technological indices.

PatentCafe

Statistical scores for patent quality used in modeling the patent collections used in this analysis were generated using PatentCafe Patent Factor Index quality analysis engine, and Portfolio DSS decision support system. www.PatentCafe.com

Biography

Andy Gibbs is the Chairman and CEO of PatentCafe, a provider of enterprise level software solutions patent research and Patent Portfolio Decision Support Systems (DSS). The company's artificial intelligence based solutions are used for quantitative analysis and management of patent assets.

He is also Intangible Assets Metrics Committee Chair, Intangible Asset Finance Society[3], the global organization committed to developing international standards to ensure visibility, transparency, and positive impact of intangible asset finance.

An IP Thought Leader, he was a Forum Moderator of a the IBM Sponsored WIKI: *Standards for Standards*[4], a global discussion of invited policy makers and IP professions addressing abuses and guideline standards for technology (patent) standards organizations, and was a member of the esteemed panel of participants in *Building a New IP Marketplace* – the IBM / NY Law School WIKI on policy and process for improving patent quality, transparency, fair valuation, flexibility and global consistency.

He served two terms on the USPTO Public Patent Advisory Committee (PPAC), and served as Chairman, E-government Subcommittee advising on Patent Office IT infrastructure and software tools. He is an immediate past member of the Board of Directors, Intellectual Property Owners Association, and a member of the Licensing Executives Society.

Mr. Gibbs authored the corporate patent strategy books, Essentials of Patents (Wiley), PatentWriter (Sq. One), *Advanced document retrieval techniques for patent research* (Elsevier World Patent Information, 2008), as well as more than 100 papers and articles on intellectual property policy, IT systems, and patent asset management.

[3] Intangible Asset Finance Society http://www.iafinance.org

[4] An IBM-facilitated online conversation during the summer of 2008, in which 70 independent, forward-thinking experts across the globe - from academia, standards, law, government and public policy - debated the question of whether standard setting bodies have kept pace with today's commercial, social, legal and political realities. (English, Chinese, Japanese) http://www.research.ibm.com/files/standardsforstandards.pdf

Contents

Background / Introduction

Patents help ensure the economic success of an enterprise, and provide the ongoing justification for continued investment in research and development in future technologies.

Because patents are the mechanism that protects certain economically valuable markets for the patent owner, it's vital that the patents are of higher enough quality to withstand challenge by competitive forces.

Qualitative patent indices can help identify patents within a collection that may provide the highest contribution to equity value of an enterprise's shareholders by generating the highest licensing revenue, by excluding competitors from the highest value markets, or by providing a defensive mechanism in response to the assertion by a competitor of its patents.

Patents that survive challenge are therefore considered valuable, while patents that fail against a challenge are considered of little or no value. While economic value of patents is difficult, if not impossible to predict by any currently available statistical method, methods to determine the underlying quality of a patent have become more accepted.

As a proxy for economic value, and further to guide the commercial patenting strategy, as well as the drafting of disclosures and claims of future patents, efforts have been made to identify metrics that correlate positively to patent quality.

It is generally accepted that the most fundamental indicator of patent quality is patent validity. Although the grant of a patent is made with the statutory assumption of validity, patent validity is frequently challenged by competitors as a means to encroach upon, or protect a high value commercial market. Patents held valid by a court of competent jurisdiction are considered more valuable than patents that are found invalid.

In order to identify certain indicators of patent quality, it is required that a study be conducted against a collection of patents for which at least one variable has been converted to a constant. In this paper, the control group is patents for which validity has been affirmed or denied by the US Court of Appeals for the Federal Circuit.

This study analyzes patents adjudged prior to the US Supreme Court decision KSR v. Teleflex, 550 U.S. ___, 127 S. Ct. 1727, 82 U.S.P.Q.2d 1385 (2007).

KSR redefined the test for obviousness by opening the interpretation of the long standing "teaching-suggestion-motivation" (TSM) test for obviousness to include "obvious to try", and a "person having ordinary skill in the art". KSR changed the fundamentals of the obviousness test, and will undoubtedly influence the decisions by patent owners regarding which patents should enter the Federal Circuit. It is reasonable to assume that the quantitative metrics for patents that patent owners elect to enforce, now knowing the full effect of KSR, are likely to differ from patents that owners elected to enforce before the KSR decision. A subsequent study is suggested to analyze the impact KSR may have had on selecting what patents to enforce.

Since patent validity, and therefore quality, is tied to precedential decisions of the court, any quality index must be timely and flexible in order to reflect the real world impact that court decisions have on patent validity.

Further, the recent *in re Bilski*, __ F.3d __ (Fed. Cir. 2008)(en banc), the nine-member majority opinion (penned by Chief Judge Michel) spelled out the "machine-or-transformation" test as the sole test of subject matter eligibility for a claimed process. A future patent quality analysis may be conducted on patents adjudged in Federal Circuit cases citing *in re Bilski*.

Each time a patent quality analysis is conducted following precedential cases, new metrics, along with appropriate controls for assumptions and variables, will be required. This process may prove to be the most important challenge in creating the reliable computer model for each condition.

A second, and not insignificant component to qualitative modeling is the size of the control set of patents. A minimum of 100 pairs of data are required to compute statistically reliable model results. This means that before a model can be tested against decisions following precedential cases, such as KSR or Bilski, a collection of at least 100 patents for which validity has been upheld or reversed, is required. This necessarily lengthens the time it takes to develop and test a model, and subsequently create the metrics that can then be fed back into the prosecution process for new patents.

This working paper will continue to evolve in response to precedential decisions by the Federal Circuit, and the availability of the minimum number of patents needed to conduct reliable modeling.

Data, Models and Methodology

Data

Reliability of multi-variant analysis requires the creation of a large, homogeneous collection of patent documents. There are two primary data collections used in this analysis:

a. Patents adjudged in the US Court of Appeals for the Federal Circuit, namely 397 patents in cases decided by the Fed. Cir. before, and after, KSR ("Fed. Cir. Collection").

b. Approximately 5.5 million US patent documents comprised of US granted patents, US reissued patents, and US published patent applications ("US Collection").

The Fed. Cir. Collection is broken into two separate collections which are included in Table 2. and Table 3. of this paper. Each of these two collections are separately comparatively analyzed against the US Collection:

I. The first sampling is a collection of 234 Patents Of Interest (POI) in cases decided by the Federal Circuit between October 1, 1982 and April 30, 2007, notably "pre-KSR" patents.

II. The second sampling is a collection of 163 POI in cases decided by the Federal Circuit between May 1, 2007 and September 30, 2008, notably "post-KSR" patents.

The US Collection includes all US granted patents, US reissued patents, and US published patent applications available at the time of this analysis. The date range of this available data collection is January 1976, ending on the date of this analysis.

Models

Analytical models were developed that permitted us to compare each Fed. Cir. POI to the most closely related patents in the US Collection. The comparison to closely related patents was a primary objective of analyzing patent quality in light of KSR, especially given the new USPTO examiner search requirements.[5] Specifically, these highlighted search requirements are precisely what advanced linguistic search technology, Latent Semantic Analysis (LSA), is optimized for to satisfy an objective and repeatable machine-based process.

[5] Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in KSR International Co. v. Teleflex Inc., Federal Register / Vol. 72, No. 195 / Wednesday, October 10, 2007

"The scope of the claimed invention must be clearly determined by giving the claims the ''broadest reasonable interpretation consistent with the specification. The search should cover the claimed subject matter and should also cover the disclosed features which might reasonably be expected to be claimed.

Although a rejection need not be based on a teaching or suggestion to combine, a preferred search will be directed to finding references that provide such a teaching or suggestion if they exist."

In order to narrow the homogeneity of the US Collection to more closely correlate to each of the Fed. Cir. patents being analyzed, a Control Group of 100 patents was developed for each POI. Each control group teaches substantially similar technology as what is claimed in each POI analyzed, referred to as the POI Tech Sphere. The development of the POI Tech Sphere using LSA search technology is detailed later in this paper.

Methodology

A four phase approach was followed in developing the analytics and subsequent patent quality scoring. The methodology called for:

1) The development of large collections of homogeneous data as previously described,

2) Identification of high frequency occurrences of patent quality indicators within the homogeneous collections. The indicators which the process computed for are called "Patent Factor Indices", and are detailed in the PFI Index Definitions below,

3) Correlation to known outcomes. Multiple correlations were made; first, the correlation of Fed. Cir. patents to court decisions of "Valid" or "Invalid" allowed the comparative analysis of quality indicators against valid or invalid patents; second, correlations were made between the high frequency occurrences of patent quality indicators against conclusions from numerous empirical studies on patent statistics,

4) The analysis of the positive and negative correlations in the preceding phases, and the identification of resulting predictive indicators of patent quality.

Controlling for Data Variables

Appearance of published patent applications within a technology sphere

There are approximately 1.916 million published US patent applications, representing a rich and highly current collection of technology disclosures useful in comparative analysis of qualitative indices against each target patent. Although US published patent applications are analyzed within the Tech Spheres, up to 70% of US patent applications are filed with the US Patent and Trademark office without assignee / applicant data. The missing company names may, in some cases, have a negative impact on the PFI commercial quality related indices 13-18. The lack of assignee / applicant data has little, if any impact on legal or technology score analysis.

Factors influencing the Number of Forward Citations

Self-citations are patents that cite closely related patents filed by the same patent applicant. Self-citations are typically found when a company filed multiple patents on substantially the same invention. In the creation of the Semantic Tech Sphere, many of the self-cited patents may appear in the search results, primarily because they are often so closely related to the POI that they are semantically discernable from the POI patent. In these cases, what may otherwise be considered as a “single invention” may appear multiple times in the Tech Sphere, thereby possibly skewing PFI commercial quality related indices 11, 12, 13, 16 and 17.

US patent applications, especially those only recently published, frequently have no forward citations. That is, because of the limited time of being in the public domain, there has not been sufficient opportunity for patent searchers to find, and reference these applications in newly filed applications. The lack of forward citations negatively affects those indices that perform comparative analysis based on forward citations.

This analysis did not control for self-citations, and “no forward citations”.

Claim Validity v. Patent Validity

Fed. Cir. patents were defined as “valid” or “invalid” based on the Court’s decision relating to the validity of one or more claims contained in each POI. However, in many cases where one claim was judged invalid, other claims contained in the POI were either upheld as valid, or not considered by the court. For purposes of this analysis, any POI that contained any claim decided by the Court as “invalid” was considered an invalid patent.

Determination of Control Group Homogeneity

PFI analysis computes 20 indicators of the overall quality of a patent. Unlike other statistical patent scoring systems that rely on a static data set to compare against a particular patent (patent classifications, for instance), PFI analysis computes the qualitative value of each POI as it compares to the technology sphere of the most closely related patents surrounding that POI.

The use of traditional methods of creating a homogeneous control group for each POI against which to compare quality indicators proved problematic.

The 234 patents in the Pre-KSR collection represent only 0.01% of active US patents, and were classified in 93 US classes of 430 main classes. Only 20 of the 93 classifications contained >2 patents 0.06% of active classes/subclasses. Given the heterogeneous nature of this collection, using patent classifications fails to provide the consistency or minimum control group needed to perform the comparative analysis.

A much larger control group, namely 2 million US patents and applications, does provide an adequate scale, provided that within this collection, narrower and more precise Tech Spheres can be identified prior to computing quality indicators for each POI.

Closely related patents have historically competed for a share of the same commercial market. Therefore, identifying the “closely related” patents for each POI was the important starting point.

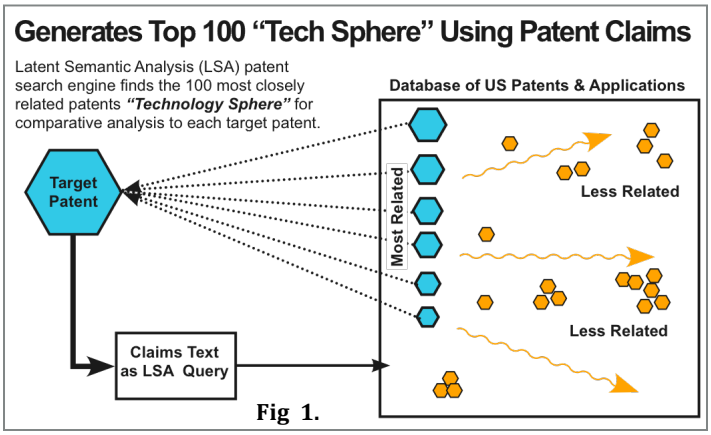

Fig 1.

Using PatentCafe’s Latent Semantic Analysis search technology and international patent datacenter, the PFI analysis automatically created a patent search query using the full claims text of the POI. The results of each patent search is a ranked list of the 100 patents most closely related to the target patent, the **”Tech Sphere”.** (Fig. 1)

A discrete Tech Sphere is created to measure indices for each POI along the three categories of PFI measurement, legal, commercial and technological.

Due to the heterogeneity of the measurements themselves, it is unlikely that any single technology

sphere measurement will be adequate for legal, commercial and technical purposes. This difficult discovery comes with a positive and a negative corollary. At present the size of the current Tech Sphere (100 patents) was sufficiently large to create a viable scale for both technical and legal estimates, although Pocklington found that the size of the Tech Sphere control group could be halved, or even reduced by 80%, to 20 related patents, and remain viable given that the pseudoreplication and temporal sensitivity issues are taken care of.[6]

Technology spheres are dynamic. As more patents are granted in any given technology area, the scope of each patent necessarily becomes narrower. Over time, the incremental value of each additional patent becomes increasingly small. Pioneering patents are frequently found to be the genesis of a given Tech Sphere, and as Jorda noted, can become increasingly commercially valuable[7].

Research has shown that oftentimes, a pioneering technology resides in a US patent classification that is completely different and non-obvious to the applicant of the subject patent before the Fed. Cir. For instance, the claims of a Hewlett Packard ink jet printer cartridge nozzle identified closely related patents in the field of fire extinguishers (Fig. 2).

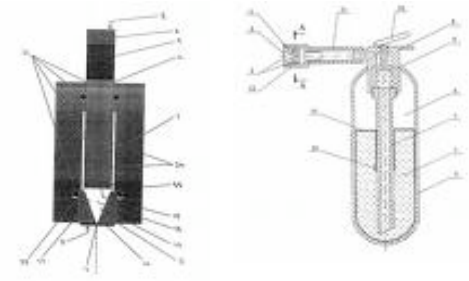

Fig 2.

Patent quality indicators are also time dependent. For example, a patent with no forward citations today may evolve as the pioneering patent as it becomes a “most cited patent” in the future. On the other hand, a patent that remains un-cited for years within a highly competitive technology sphere may prove to be very low quality, and not warrant the continued investment of patent maintenance fees.

Real time qualitative analysis of each POI, or of an entire patent portfolio, provides the decision-support information intellectual property managers need to make time dependant, and time sensitive business, legal or technology decisions.

PFI analysis finally employs large-scale statistical patent modeling against the Tech Spheres using the regression, econometric, patent citation, and bibliometric models taught in the empirical studies referenced in this paper.

[6] Pocklington, Richard, PatentCafe Technology Sphere Report, Working Draft 4.2, Sept 6th 2008

[7] K Jorda, Intellectual Property Valuation. The Legal Counterpart/Counterpoint 2004

Comparing Pre-KSR and Post-KSR Patent Quality

In this study, 30 patent quality indicators from 397 patents were analyzed.

397 discrete Tech Spheres were semantically created for each POI, each Tech Sphere containing a control group of the 100 patents most closely related to the claims text contained in each POI.

In total, 30 indices for 40,097 patents were analyzed (100 patent Tech Sphere for each of the 397 patents, plus 397 POI patents). 1,020,910 discrete data points were developed during the initial analysis. Secondary analysis performed comparisons between the data points of each POI and its respective data points for patents contained within its Tech Sphere.

Findings

In the 2006 cases reviewed for this study, 63% of the decisions found for the defendant, 37% favored the plaintiff. In post-KSR cases, 71% of the decisions favored the defendant, while 29% found for the plaintiff. The 11% increase in post-KSR decisions favoring the defendant reflects, on average, an increase of patents being declared invalid in the post KSR court.

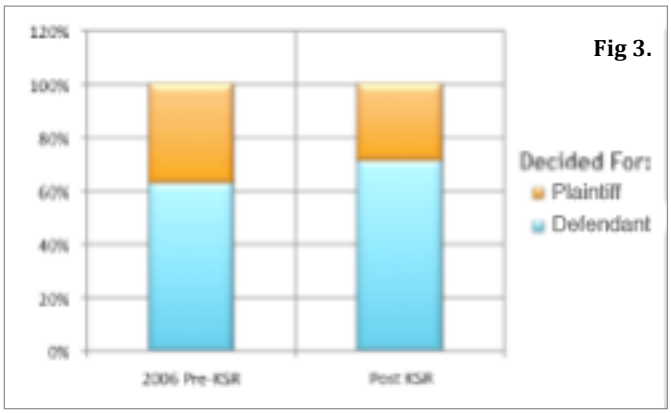

Fig 3.

There was also an observed shift in the number of originally unassigned patents that found their way to the CAFC under a new assignee / owner.

In the 2006 cases, 18% of the patents in decisions favoring defendants, and 17% of the patents in decisions found for the plaintiffs were originally issued without a recorded assignee, and were assigned to a third party prior to, or during the litigation.

However, in post-KSR decisions, defendants in cases involving originally unassigned patents prevailed more often (22%) compared to decisions favoring the defendant in 2006 (18%).

Conversely, plaintiffs in post-KSR cases involving originally unassigned patents prevailed less often (9%) compared to plaintiffs asserting originally unassigned patents in 2006 (17%), a 47% drop from 2006.

It is likely that the new obviousness definition in the post-KSR environment[8],in part, contributes to this shift toward more decisions favoring the defendant post-KSR, but computing "obviousness" was not within the scope of this analysis. The shift in decisions favoring defendants may simply reflect a more aggressive defense against assertions of patents acquired by owners for the primary purpose of enforcement. Overall, the raw and computed data does show increased scores in many key indicators of patent quality in post-KSR decisions.

Meaningful statistical patent analysis necessarily requires the review of many interrelated patent quality indicators. It is well known that "single score" patent analysis methods lack the resolution necessary to evaluate discrete quality metrics, and may obfuscate observation of key indices.

	TOTAL SCORE	LEGAL SCORE	COMMERCIAL	TECH SCORE
For Defendant				
2006	604	651	579	581
Post KSR	620	672	602	620
Percent Change	3%	3%	4%	6%
For Plaintiff				
2006	601	622	567	614
Post KSR	614	679	614	705
Percent Change	2%	8%	8%	13%

Table 1.

For example, to obtain a "single score", the author computed "total average scores" (using a 0-1000 scale) of the subject patents of the reviewed cases. The total average quality score for patents in decisions for the defendant was 604 during 2006, versus 620 for post-KSR cases (3% quality increase). Patents in 2006 decisions for the plaintiff scored 601 compared to 614 for post-KSR cases (2% quality increase).

The data shows that patents that found their way to the bench in the post-KSR era scored higher overall, but in many cases, the quality increase of key indices was statistically insignificant.

A clearer picture emerges as more detailed quality indicators are analyzed (Table 1.). Post-KSR patents generated higher average scores in every legal, commercial, and technology quality factor analyses.

It was not within the scope of this analysis to research possible causes for the increase in post-KSR patent quality.

[8] "We begin by rejecting the rigid approach of the Court of Appeals. Throughout this Court's engagement with the question of obviousness, our cases have set forth an expansive and flexible approach inconsistent with the way the Court of Appeals applied its TSM test here." Supreme Court in KSR v. Teleflex, 550 U.S. ___ (2007)

However, analyzing the scores of 30 discrete indices contributing to the legal, commercial and technology averages in Table 1. does provide more insight on the patent quality metrics which positively correlate to the indicated shift in decisions in post-KSR cases.

LEGAL FACTORS

PatentCafe's Patent Factor Index separately analyzes eight quality indices: Enforceability, Semantic Relevancy Strength, Novelty, Claim Scope, Prior Art Validity, Concurrent Art Validity, Sustainability in Opposition, and Litigation Avoidance. During this analysis, the pre/post KSR scores for enforceability (legal status), novelty[9], and sustainability in opposition did not reflect a statistically significant change.

However, Relevancy Strength (a linguistic analysis ranking each POI against patents within the Tech Sphere), Claim Scope, Validity Confidence (based on statistical Prior Art and Concurrent Art probability), and Litigation Avoidance showed considerable 2006 v. post-KSR differences.

Relevancy Strength

The sharpest increase in legal quality indices was seen in Relevancy Strength. Relevancy Strength analysis uses an LSA search query comprised of the full text of the claims of the patent being analyzed. The score is determined based on the ranking of the analyzed patent within the Tech Sphere, As an example, a patent that ranks #1 receives a score of 1,000. When more patents in the search results rank higher than the patent being analyzed, the score drops.

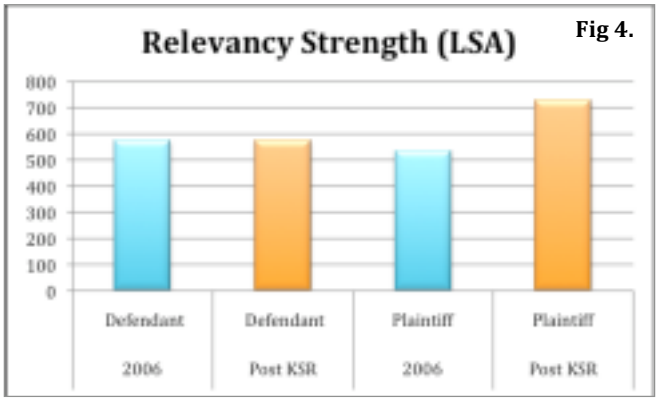

Fig 4.

Relevancy Strength for patents in cases decided for the defendant remained almost unchanged for 2006 versus post-KSR (near midpoint 575 v. 574 respectively). However, Relevancy Strength scores for patents in cases decided for the plaintiff moved up from 534 in 2006, to 727 in post-KSR decisions (up 27%).

The 727 score of patents favoring the plaintiff in post-KSR cases indicate that, on average, the specifications of the patents for which the plaintiff

[9] Reitzig, Markus. (Version: December 2003) What Do Patent Indicators Really Measure? – A Structural Test of 'Novelty' and 'Inventive Step' as Determinants of Patent Profitability.

prevailed were more closely related to their respective claims than patents for which the plaintiff prevailed in 200 cases.

Relevancy Strength also serves as a statistical test of how well a patent specification supports the patent claims[10].

Plaintiffs prevailed more often in post-KSR cases with patents that scored significantly higher in Relevancy Strength when compared to Relevancy Strength scores of plaintiffs' patents during 2006.

Invalidity Risk

Except for enforceability (legal status is active, with paid-up issuance and maintenance fees), patent validity is considered the single most important component of patent quality.

Although all granted patents carry the presumption of validity, the post-KSR environment has retroactively cast new criteria challenging validity presumption. Patent invalidity risk is therefore a key consideration prior to patent assertion, and more importantly, to the underlying quality of each patent overall.

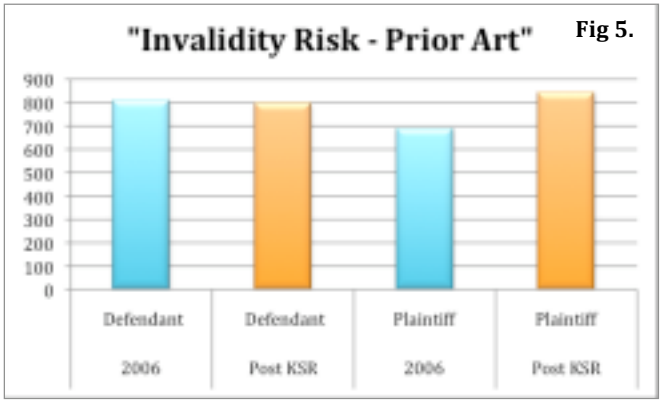

Fig 5.

LSA relevancy ranking has proven to be a consistently reliable proxy for validity confidence.

PatentCafe's PFI quality scoring system takes the full text of the claims of each patent being investigated, automatically applies it as a Latent Semantic Analysis query to a US granted and published application database, and inserts the target patent within the search results – the Technology Sphere patents receiving the highest relevancy scores.

Using an analysis similar to the Relevancy Strength scoring above, the PFI compared the target patent score (where it appears within the search results relevant to its own claims) to all other earlier filed, higher ranking patents in the search results, and computes an invalidity risk score. The PFI analyzed

[10] 35 U.S.C. 112. http://www.uspto.gov/web/offices/pac/mpep/documents/appxl_35_U_S_C_112.htm

both prior art and concurrent art (relevant patents co-pending during the target patent's prosecution that are not cited by, and do not cite the target patent).

On average, the Validity Scores increased for all patents decided in post-KSR cases (Figs. 5. & 6.).

Fig 6.

In post-KSR cases in which defendants prevailed, the validity score average increased slightly (1.9%), with Prior Art scores of patents asserted against them actually falling (2%). This indication positively correlates successful defense to a decline in the validity of the asserted patent. The finding also suggests a negative correlation to post-KSR cases in which defendants prevailed against claims with higher validity confidence. More prior art was statistically identified using PFI validity scores, especially considering broader interpretation of the asserted claims following KSR.

The increase in validity confidence scores was more pronounced in decisions favoring the plaintiff. In post-KSR decisions, asserted patents were of significantly higher quality (15.5% increase in validity confidence scores) compared to cases decided for the plaintiff during 2006. Prior art validity confidence climbed 18%, and concurrent art validity confidence rose 13%.

In cases in which plaintiffs prevailed, the validity score average increased by 15.5%.

The increase in post-KSR validity scores point to a positive correlation between higher validity scores and successful assertion. The upward shift in validity scores in post-KSR cases may also suggest that statistical validity scoring of patents could be a secondary decision-support indicator that should be considered prior to assertion.

The current study did not explore the use of PFI validity scores as a predictor of future Court decisions.

Litigation Avoidance

It's been shown that the more frequently a patent is cited within three years of issuance compared to the most closely related patents, the more likely it is to be litigated during its life cycle[11]. Conversely,

[11] Lanjouw, Jean O. and Schankerman, Mark (Revised March 2000) Characteristics of Patent Litigation: A Window on Competition.

patents with no technical or commercial value will seldom be cited, or litigated, and will have higher litigation avoidance scores.

Fig 7.

This suggests that patent owners that are competing in a valuable market segment will likely need to turn to litigation in order to protect revenue. On the other hand, competitors will invariably attempt to invalidate patents that protect what the competitors envision as financially lucrative markets.

Therefore, plaintiffs hoping to effectively enforce patents will look to those with a LOWER score (more contested patents / markets that are less likely to avoid litigation).

PFI analysis of Litigation Avoidance was initiated by using as an LSA search query using the claims text of each POI, and identifying the Tech Sphere. An analysis is then performed comparing the forward citations for each POI to their respective Tech Sphere.

In cases decided for the defendants, litigation avoidance for the asserted patents in 2006 was 575, compared to an average post-KSR score of 741, a significant increase (22%). The average score increase shows that the post-KSR patents were LESS likely to be litigated based on relative citation value of their most closely related patents (Fig. 7).

Cases involving patents with higher litigation avoidance scores showed LESS likelihood of being litigated, and were decided for the defendant.

Consistent with findings favoring the defendant, plaintiffs that prevailed in post-KSR cases did so with patents that earned lower scores than patents in the 2006 cases.

Cases involving patents with lower litigation avoidance scores showed HIGHER likelihood of being litigated, and were decided for the plaintiff.

As an indicator of patent quality, PFI scores suggest that patents more likely to be litigated are those that tend to be of a “pioneering nature”, are earlier filed within a technology corpus, may be of higher overall quality.

The Litigation Avoidance scores of the patents in post-KSR decisions analysis correlate positively to this PFI model.

Claim Scope

The traditional model of claims drafting has been to cast the broadest possible net of embodiments of an invention.

The question arose as to whether in a post-KSR environment drafting broad claims could have a contra effect of reach beyond the narrow focus of the invention, thereby opening the claims to challenges from industry or technology segments that have historically been considered "analogous art". The reach into these analogous segments could trigger an obviousness issue leading to invalidity.

Fig 8.

On the other hand, industry has traditionally considered tight, narrow claims easier to assert against specific infringement targets, and as a result, carrying a lower risk of invalidity.

Further, the Accelerated Examination Search Document[12] outlines search requirements that "encompass all of the features of the claims, giving the claims the broadest reasonable interpretation". LSA, which searches concepts rather than keywords, returns search results based on the broadest interpretation of the text of the claims.

Another objective of this study was to determine whether LSA analysis of claim text could provide a data set against CAFC decisions in 2006 and post-KSR cases that could be of predictive value in assessing future CAFC decisions.

The defendants' average claim scope scores of patents successfully defended in post-KSR decisions were lower than claim scope of patents in 2006 decisions: 417 in post-KSR versus 495 in 2006, (-19%). (Fig. 8.)

This drop in Claim Scope scores suggests that patents decided for the defendant in post-KSR cases cited more patent and non-patent references, and were therefore narrower than the claim scope of patents in decisions favoring defendants in 2006.

[12] Changes to Practice for Petitions in Patent Applications To Make Special and for Accelerated Examination, http://www.uspto.gov/web/offices/com/sol/notices/71fr36323.pdf

The change in Claim Scope score was significantly different for patents in cases decided for the plaintiff. The average claim scope scores of patents successfully prosecuted in post-KSR decisions were significantly higher than claim scope of patents in 2006 decisions: 500 in post-KSR versus 397 in 2006, (+21%).

The significant increase in Claim Scope scores for patents in post-KSR cases decided for the plaintiff suggests that broader claim scope may have contributed to the favorable decisions. Conversely, broader claim scope actually open more opportunity to defend against the claims by citing otherwise analogous technologies that may support an obviousness argument.

Claims characteristics unaccounted for in this PFI analysis, and which could positively or negatively affect the summary conclusions include:

1. The number of patents within any particular technology or product area may be insufficient to identify a repeatable correlation between the quality or the analyzed patents and the case outcomes.

2. This study used only machine analysis, and did not incorporate any hand analysis of the opinions rendered for each case. Hand analysis that identifies individual claims at issue in each case could provide a higher quality control group of both LSA search queries, and subsequent results analysis.

3. Machine analysis of claim text did not consider claim type; the LSA search uses the full text of all claims of the POI in order to comparatively analyze Claim Scope against the Tech Sphere. For instance, the full claims text in any given patent may include (a) an independent claim for an apparatus, (b) an independent claim for a method of business, (c) an independent claim for a process. The LSA search results using search query text that describes a combination of an apparatus, method, and process, may offer little predictive value for assessing future case outcomes.

4. Claim Scope scores are statistically lower for a POI when the POI has more backward citations (patent and non-patent references) than the Tech Sphere. However, the data is offset if the corresponding volume of claims of the POI is also higher than the Tech Sphere. In these cases, the higher number of claims may correlate to a greater number of market opportunities as shaped by the high number of backward citations. These variations were not accounted for in this analysis.

5. Higher claim scope scores of patents in post-KSR cases favoring the plaintiff positively correlate to broader claim scope interpretation in view of KSR. Increasingly narrower scope of asserted claims (-12%) were found in post-KSR cases where defendants prevailed. Conversely, more broadly interpreted claims (+21%) were found more often in cases where plaintiffs prevailed (Fig. 8).

Because of these complexities related to Claim Scope analysis, the data is inconclusive, and no conclusions are presented with respect to Claim Scope as an indicator of patent quality in these CAFC cases. In a future research project, a more detailed study of individual claims of each POI may provide the data to support a more predictive correlation between Claim Scope scores and post-KSR CAFC decisions.

COMMERCIAL FACTORS

While a patent's commercial factors are less likely to influence or correlate to CAFC decisions, they are nevertheless reliable indicators of the overall quality of a patent. Qualitative analysis of commercial indices is most useful in supporting decisions related to patent licensing, acquisition, portfolio acquisition or divestiture, damages calculations, and general commercial value of a patent, or entire portfolios, within any given market.

Of the 8 commercial quality metrics computed by PatentCafe's Patent Factor Index analysis of these cases, the pre/post KSR scores for two indices, Backward Citation Value and Crowdedness, did not reflect a meaningful change.

Forward Citation Value

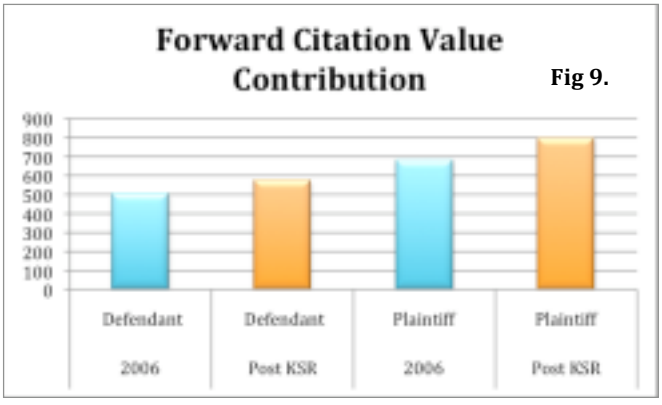

Fig 9.

Forward citations have long been used as a proxy for patent value[13]. However, it's well known that examiner's "pet citations" and self-citations routinely skew forward citation analyses, causing this metric to be an inconsistent and unreliable predictor of patent quality. However, forward citation value is nonetheless one of the commercial indices that, within the context of total commercial

[13] Hall, Bronwyn H., Jaffe, Adam B. and Trajtenberg, Manuel. (2004). Market value and patent citations. JEL Classification: O31, O38 – 2004.

value analysis, is scored in the PFI model (Fig. 9).

Average forward citations scores exceeding 500/1000 for POIs in the 2006 cases were determined to be important indices. Consistently, patents in 2006, as well as post-KSR cases decided for the plaintiff had higher forward citation value scores compared to patents in cases decided for the defendant. Post-KSR, the forward citation scores for patents in cases decided for the plaintiff and defendant increased 14% and 12% respectively.

Overall, patents in cases decided after KSR were of higher commercial quality than patents in cases decided in 2006. Additional study is required to determine whether the statistically higher quality patents in post-KSR cases is a coincidental occurrence, or whether the higher bar to prevailing in CAFC cases influences parties to a litigation to settle more often when litigating lower quality patents, thereby leaving decisions on higher quality patents to the Courts.

Partnering Potential

The PFI analysis gives the broadest interpretation to the claims as a search query to identify the Tech Sphere. Patents in the Tech Sphere can be comprised predominantly of patents within the same US classification as the POI, but are most often comprised of patents granted across a wide and varied range of classifications.

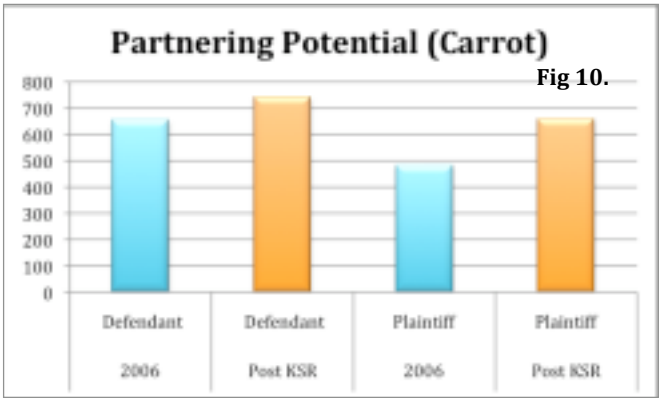

Fig 10.

In the present study, the most significant gains in Partnering Potential were seen in patents from post-KSR cases decided for the plaintiff. Fig. 10. showed average Partnering Potential patent scores in post-KSR cases were 659, compared to 483 in 2006 cases (+27%).

Partnering Potential scores also increased in post-KSR cases decided for the defendant, from 655 in 2006 to 741, a 12% increase.

When the claims text of the POI returns patents granted in classifications different from the POI, the differently classified patents invariably teach what is claimed in the POI, and the potential to license or assert the POI in these peripheral technologies or market areas increases.

However, when patents from other classifications (different technology or market areas) read on the claims of the POI, there is an inherent risk that the specifications of these peripheral patents may teach the invention of the POI, leading to obviousness questions.

Litigating attorneys relying on keyword searching without the benefit of semantic analysis of claims text will not routinely discover patents outside of the main classifications of the POI. Therefore, it's unlikely that arguments related to obviousness in the post-KSR cases relied on classification-agnostic analysis of related, but differently classified specifications.

A positive correlation of high value partnering potential to increased claims scope breadth was identified. As the average claim scope breadth of post-KSR patents increased, so too did the number of different patents classifications contained within the Tech Sphere, suggesting that broader claims captured patent specifications from peripheral technology areas.

The data indicated that the highest rate of score increase in both broader Claim Scope and Partnering Potential favored the plaintiff in post-KSR decisions, however, these metrics may not be reliable predictive indices of future decisions since semantic analysis of the POI claims by defendants may identify more patents supporting arguments in favor of obviousness. These arguments may lead the Court to determine invalidity more often, increasingly favoring the defendant.

Patents with higher enforcement and opportunistic licensing potential correlated positively to higher patent value, pointing to patents that are more often litigated[14]. The PFI patent evaluation model used Latent Semantic Analysis to statistically compute overall licensing potential.

[14] Lanjouw, Jean O. and Schankerman, Mark (1998). Stylized Facts Of Patent Litigation: Value, Scope And Ownership. Department of Economics, London School of Economics and Political Science.

Enforcement Potential

Enforcement Potential is the indicated ability to derive licensing revenue from larger patent owners, defined by the total number of same-owned patents by companies that share ownership of the Technology Sphere. Lower scores indicated that the ownership within the Tech Sphere was distributed across many owners (no dominant owner). Higher scores are realized when a smaller number of patent owners (potential licensees) each have made significant investments in product/market development, resulting in the ownership of a substantial number of the Tech Sphere. In other words, fewer companies dominate the technology segment.

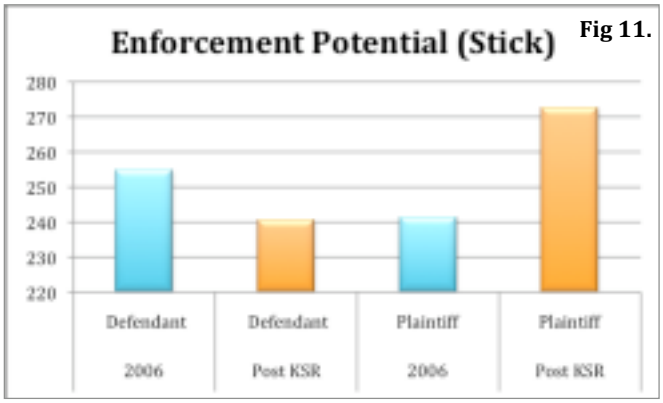

Fig 11.

Average Enforcement Potential scores for patents in post-KSR cases decided for the defendant dropped to 241 when compared to the average 2006 score of 255 (-6%), positively correlating to lower plaintiff scores for Enforcement Potential, and increased frequency of decisions favoring the defendant. (Fig. 11.)

In cases where the CAFC decided in favor of the plaintiffs, post-KSR Enforcement Potential scores rose from 241 in 2006, to 273 in post-KSR cases (+11%)

- Successful post-KSR enforcement (prevailing at trial) by plaintiffs that dominated a technology segment correlated positively with patents scoring higher on Enforcement Potential.
- On average, post-KSR decisions favoring defendants increased as enforcement potential scores for asserted patents decreased (fewer plaintiffs dominated the technology segment as defined by the 100 Patent-Cluster).

Divestiture Licensing Premium

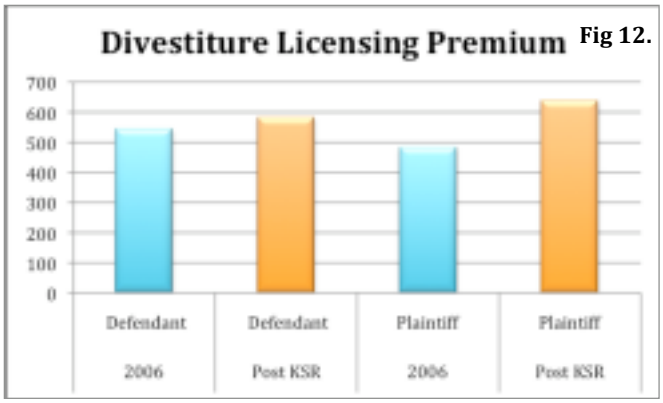

Fig 12.

Divestiture Licensing Premium is defined as a synergistic value attributable to each patent owned by the assignee that also owns a group of patents that control a given market. After the LSA search using the claims of the POI returned the POI Tech Sphere, the analysis assigned a score to the POI correlating to the number of patents within the Tech Sphere that are also owned by the

same assignee (Fig. 12.).

- Post-KSR defendants prevailed more often when POIs earned lower Divestiture Licensing Premium scores (7%), compared to patents in the 2006 cases.
- Conversely, plaintiffs receiving favorable post-KSR rulings were enforcing POIs that earned significantly higher Divestiture Licensing Premium scores (24%) than patents enforced by successful plaintiffs in 2006.

In-licensing Opportunity

In-licensing Opportunity is a PFI index that scored a given patent based on the number of unassigned closely related patents that appear in the Tech Sphere, following an LSA search using the claims text of the POI as a search query.

In-licensing Opportunity is a valuable metric for organizations seeking to quickly build portfolios in a given technology domain since the PFI identifies unassigned patents that (a) contribute to the portfolio composition to maximize value, and (b) may be acquired as a discount from small entities that may have little interest in continuing long term maintenance fee investment in patents they may not currently be commercializing.

The availability of closely related but unassigned patents within the domain of the plaintiffs' patents diminished in post-KSR cases.

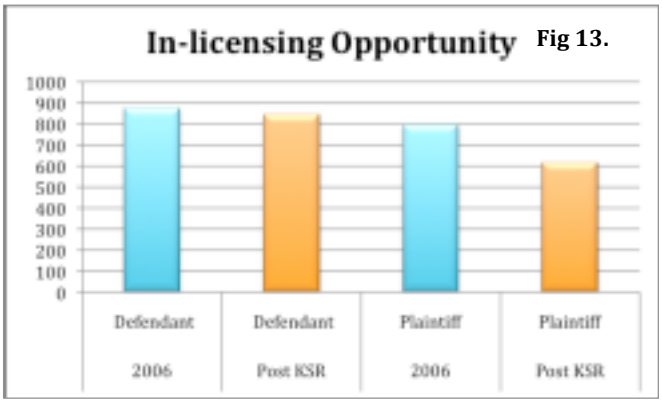

Fig 13.

In cases decided for the plaintiff, a significant drop in In-Licensing Opportunity scores (-29%) was observed (Fig. 13.)

The post-KSR decline in In-Licensing Opportunity scores compared to In-licensing Scores of patents is cases decided during 2006 may be a strong indicator of a "land grab" of the highest quality, unassigned patents by companies attempting to build more robust portfolios for either defensive, or offensive purposes.

TECHNOLOGY FACTORS

PatentCafe's Patent Factor Index Report used a variety of techniques to compute four technology quality factors. While some of these indices experienced statistically insignificant change between 2006 average scores, and post-KSR scores, a few early trends were discovered.

Technology Advancement

Technology Advancement appeared to be the only significant technology factor that markedly changed between 2006 and post-KSR. However, small changes in other technology factors may be early indicators of emerging quality trends of patents litigated in a post-KSR environment.

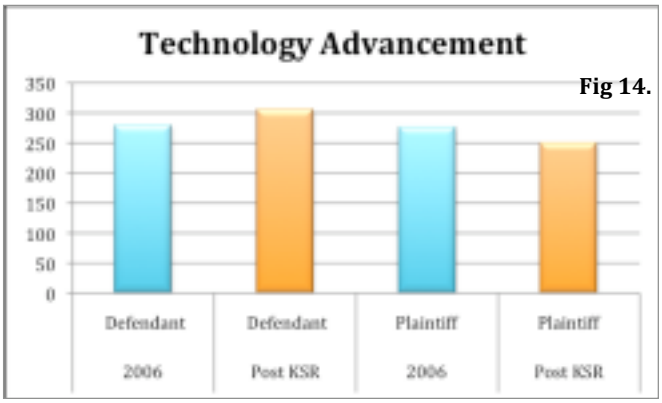

Fig 14.

Technology Advancement scores heavily rely on the number of backward patent and non-patent literature citations as indicators of advancement over prior art. When compared to the Tech Sphere, a POI containing a very large number of backward citations generally indicates a closer link between the POI, and prior art, and a smaller increment of technology advancement (Fig. 14.).

With respect to the scores generated in cases decided for the defendant, fewer backward citations of post-KSR patents indicate that the POI discloses more advanced technologies than in 2006 cases. The higher post-KSR scores could reflect patents more advanced (more distanced) from the alleged infringement, or patents with fewer references that reflect fewer limitations of the claims, both conditions that aid in the defense of an asserted patent.

More clearly, in cases decided for the plaintiff, the 10% drop in Technology Advancement scores in post-KSR patents positively correlates to the raised standard for non-obviousness. The larger number of backward citations, which result in lower scores, cause the applicant to more narrowly construe the scope of the claims of the invention. Narrower claim scope increases the difficulty the accused party will encounter in trying to identify un-cited prior art that may invalidate the patent.

Technology Sophistication

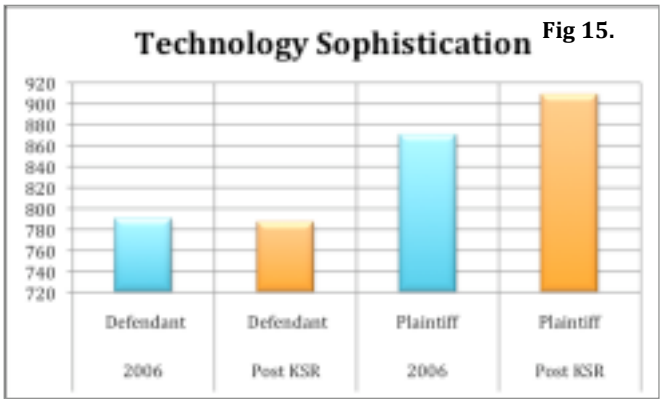

Fig 15.

Technology Sophistication scores of all patents in all cases, regardless of rulings favoring the defendant or plaintiff within either the 2006 and post-KSR groups were quite high, closely ranging between 787 to 909 (Fig. 15).

Comparative forward citation analysis is a core component of the Technology Sophistication index.

It was observed that the more heavily cited patents are being carried through to trial. These figures should be interpreted along with the Forward Citation scores.

Combinatorial Accession

Combinatorial Accession is defined as the diffusion of a particular technology across various industry or market segments – indicated by the number of closely related patents with US patent classifications that differ from the main classification of the POI.

As an example, the Hewlett Packard invention of an ink jet printer nozzle for high resolution printing of photographs (US patent classification 347) preceded later patents in the fire extinguisher industry that claimed nozzle designs (US patent classification 159, 169, and 239) that performed nearly identical function – keeping the sprayed stream very narrow. The relationship between two inventions that are in completely different patent classifications, could support obviousness arguments in light of KSR.

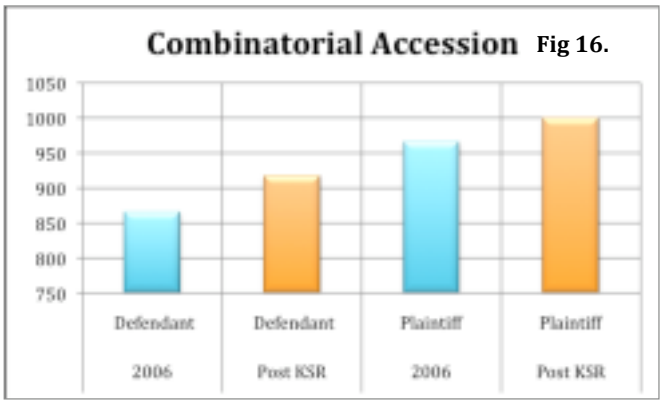

Fig 16.

When a core technology such as the ink jet printer nozzle finds its way into different industries to solve similar problems, the value of the patent increases, and the "reach" of the technology into other non-obvious industries reveal new enforcement opportunities, as well as new invalidity risks.

Combinatorial Accession scores were exceedingly high across the board. However, in cases decided for the defendant, average post-KSR scores jumped 6% (Fig. 16). This nominal score increase may not signify the start of a trend, however, in light of KSR, the PFI analysis uses Latent Semantic Analysis to identify inventions in US patent classifications different from the POI in an attempt to identify inventions that would be obvious to persons of ordinary skill (but in different industries, solving different problems).

A higher score correlates positively to a stronger defense by looking at non-obvious industry segments in which the technology of the POI, alone or in combination with different inventions, may meet the KSR obviousness standard.

Technology Cogency

Technology Cogency is defined by the Patent Factor Index algorithm as the score for technology "strength" as primarily defined by the number of named inventors on each patent. In other words, more inventors correlate to a "stronger" technology.

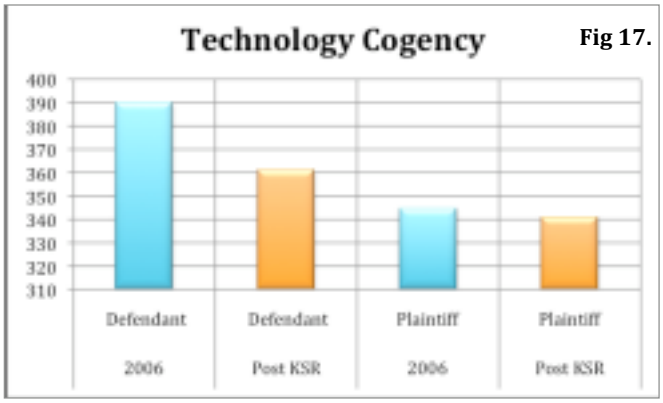

Fig 17.

As shown in Fig. 17., Technology Cogency was not found to be a significant factor in any of the cases examined. In post-KSR cases decided for the defendant however, a slight decrease in Technology Cogency scores correlates positively to an increase in decisions in which defendants prevailed over patents claiming "weaker" technology.

Conclusions

Computer modeling of homogeneous groups of patents appears to be effective in high-resolution identification of qualitative differences between the groups.

When applied to patent collections grouped by pre-established characteristics, such as CAFC decisions for defendants or plaintiffs over a specified timeline, Patent Factor Indices were shown to effectively identify trends and variations in patent quality, as well as consistent correlation between quality indicators and CAFC decisions.

The findings of this study show that overall quality of patents in CAFC decisions following KSR has increased, as illustrated by the high number of indices positively correlating to trends in CAFC decisions.

Overall, this analysis suggests an average increase in validity confidence scores of **all** patents finding their way to the CAFC. However, in the post-KSR environment, the data suggests that plaintiffs that prevailed overcame a significantly higher bar to validity confidence when compared to defendants searching for more prior art supporting invalidity.

Certain indices showed very significant changes in post-KSR decisions when compared to CAFC decisions in 2006. More specifically, computed scores showing very high positive correlation to CAFC decisions include:

- legal factors (computed claim scope, validity confidence, and probability of litigation avoidance),
- commercial factors (forward citation value contribution, enforcement licensing potential, divestiture licensing potential, and partnering potential), and
- technology factors (technology advancement and combinatorial accession)

This study showed a trend suggesting that these indices are becoming increasingly important as management decision-support data points when considering licensing, patenting, enforcement, or portfolio acquisition strategy.

While these index scores are the result of analysis of recent cases, all of which were being actively litigated prior to KSR, there is no assurance that the trend will continue.

KSR had little influence in directing which patents were adjudicated in the post-KSR environment, since all of the patents entered into litigation prior to the KSR decision. The Court's opinions however, were influenced by KSR, and although the cases were decided on merit, the Court may have weighed differently certain qualitative measures in forming their decisions. An analysis of cases decided on patents entering into litigation after KSR will be required to prove or disprove the thesis of a positive correlation between patent quality and CAFC decisions.

KSR will likely influence what patents management relies upon in support of future infringement litigation, and what licensing or litigation strategy will be pursued in light of the changing post-KSR environment. A supplemental analysis should be performed at such time a sufficient number of decisions is rendered by the CAFC on cases that first entered litigation following KSR v Teleflex.

Further Reading

Gibbs, Andy, *Application of Multiple Known Determinants to Evaluate Legal, Commercial and Technical Value of a Patent* (2006)

Gibbs, Andy, *Practical Application of Statistical Patent Quality Analysis of Patent Portfolios for Decision Support in Intellectual Property Management* (2007)

Gibbs, Andy, *Comparison of Statistical Quality Indicators of Patents in CAFC Decisions Before and After KSR V. Teleflex* (2008)

Ryley, Saffer & Gibbs, *Advanced document retrieval techniques for patent research,* World Patent Information 30 (2008) 238–243

Exhibits

PFI Definitions

Panel 1

Table 2 (Pre-KSR Patents)

Table 3 (Post-KSR Patents)

PFI Index (Idx) Definitions

No single statistical indicator of patent value has been determined to be reliable, repeatable and consistent in supporting myriad inquiries of patent value as determined by the legal, commercial and technology sectors. However, many empirical studies have proven models that can be relied upon as predictive of patent quality, or characteristics that support conclusions regarding patent quality.

It is believed that this study is the largest multi-variant analysis performed on patent collections, relying on more than 19 separately conducted empirical studies completed by contemporary economists and scientists, published between 1990 and 2008.

New indices introduced in this study have been made available only by use of the LSA as a concept-based search technology. LSA has allowed the creation of homogeneous collections (Tech Spheres) within which indicators of patent quality can be correlated to known outcomes. LSA, which relevancy ranks the collections in response to a search using the claims of the POI as a linguistic query, provides additional resolution in identifying new indicators of patent quality. These new indices (Idx.), included below, are: Idx. 2, 5, 6, and 23. More notably, the application of LSA in identifying the most closely related Tech Spheres introduced the ability to create each homogeneous collection based on linguistic similarity rather than the problematic data points such as US patent classifications.

Idx 1. Enforceability

A US patent has three maintenance fee payment dates between issuance and expiration. Failure to pay maintenance fees, or expiration results in an unenforceable patent. If a patent is in review, the enforceability rating is reduced since there is a chance the patent will be invalidated.[15]

Idx 2. Total Relevancy Strength

Relevancy ranking of this patent compared to the 100 most relevant US patents returned from a Latent Semantic Analysis search using the full text claims of this patent. Patents that teach the art better than the POI from which the claims were used represent invalidity / infringement risks or enforcement / licensing opportunities, depending on whether the search results patents were earlier filed, or later filed, when compared to the POI filing date.

Idx 3. Novelty

This index is based on backward patent citations. A higher number of backward citations generally indicates a reduction of invention novelty. This indicator shows the placement in number of backward citations compared to the 100 most relevant patents.[16]

[15] 35 U.S.C. § 365 Right of priority; benefit of the filing date of a prior application

[16] Market value and patent citations (Hall, Jaffe & Trajtenberg) JEL Classification: O31, O38 – 2004.

Idx 4. Claim Scope Breadth

Patents containing a higher number of backward patent and non-patent citations have been shown to have a narrower scope of claims (more limitations) than related patents with fewer citations.[17]

Idx 5. Validity Confidence (Un-Cited Earlier Filed Art)

Patent Validity may be the ultimate indicator of patent quality. A lower number of highly relevant but un-cited patents with earlier filing dates, disregarding earlier prior art issue dates, increases the confidence of the POI surviving an invalidity challenge.[18]

Idx 6. Validity Confidence (Un-Cited Concurrent Art)

Discovery of fewer highly relevant but un-cited Concurrent art patents (co-pending during prosecution) increase the confidence of surviving an invalidity or infringement challenge. Index 6 is similar to index 5, with the exception that this index looks specifically at patents that neither cite the POI, nor are cited by the POI, since the group of patents was being prosecuted by the USPTO at the same time.

Idx 7. Sustainability In Opposition

The number of inventors on a patent significantly correlates to opposition survivability; the fewer inventors, the more likely a patent is to survive opposition.[19]

Idx 8. Litigation Avoidance

When compared to closely related patents, if this patent has fewer forward citations within 3 years of issuance, it will substantially increase likelihood of avoiding future litigation.[20]

(Idx 9 and Idx 10 reserved for future use)

Idx 11. Forward Citation Value Contribution

A larger number of forward citations when compared to the 100 most closely related patents disproportionately increases the value of this patent.[21] Compared to relevant patents within the POI's technology sphere, each extra citation per patent has been statistically shown to increase market value by 3%. Patents with two to three times the median number of forward citations carry a 35% value premium, and those with 20 citations and more have been shown to correlate to a 54% market value premium.

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[17] An analysis of the source of EPO citations: applicant vs patent examiner citations; Applied Econometrics Association, by Criscuolo, Geuna & Verspagen, 2004

[18] Internet Business Method Patents, John R. Allison, Emerson H. Tiller; McCombs School of Business, University of Texas at Austin

[19] What Do Patent Indicators Really Measure? Testing Current Theory on Value Drivers of Innovations Within a Structural Two-Stage Discrete Choice Simultaneous Equation Model, Markus Reitzig, January 2003

[20] Characteristics of Patent Litigation: A Window on Competition, Jean O. Lanjouw and Mark Schankerman, Revised March 2000

[21] Market Value and Patent Citations: A First Look, Jaffe, A., and Trajtenberg, M.; Working Paper No. 7741, NBER, 2000

Idx 12. Backward Citation Value Contribution

The larger number of backward patent citations tends to suggest a larger market size. Backward citations are a less reliable contributor to patent value than Forward Cites.[22]

Idx 13. Enforcement Licensing Potential

Fewer applicants dominating a particular field present a more favorable environment to pursue more costly opportunities to generate the highest revenue per licensee.[23]

Idx 14. Partnering Licensing Potential (Cross-Classification)

Licensing potential into non-obvious or unrelated patent classes is based on invention activity in closely-related markets protected by different US classifications.[24] Following KSR, obviousness can now extend into technology areas previously analogous, or "non-obvious".

Idx 15. Crowdedness (Potential Licensees)

Crowdedness (more assignees practicing highly related patents that are within the top 100 most relevant) suggests more activity in the market, and more licensing opportunities.

Idx 16. Divestiture Licensing Premium (Patent Group)

Broader market protection corresponds to the increased number of patents, and value of each patent this applicant owns (Patent Group) within the 100 most relevant. A POI that is the only patent owned by a company does not leverage the benefit of having other closely related patents to group together for a more formidable enforcement strategy. On the other hand, a POI that is but one of many within the technology sphere owned by the same company will enjoy a premium on its potential commercial value – a synergistic effect realized when the POI is bundled, or grouped with its closely related same-owned patents.

Idx 17. Patent Group Competitive Position

The competitive position of this applicant's Patent Group relative to the size of other applicants' Patent Groups identified within the 100 most relevant patents.[25] This index is similar to the previous Divestiture Licensing Premium, except it more generally defines how competitively the owner of the POI is positioned against other multi-patent owners within the same technology sphere. The importance of this index relates back to the POI owner's research and development budgets and strategy, and may significantly influence the company's long term patent filing and portfolio-building strategy.

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[22] Backward citations to the patent literature are an indicator of market size *(+Harhoff and Reitzig 2002)*

[23] Characteristics of Patent Litigation: A Window on Competition (Jean O. Lanjouw and Mark Schankerman, Revised March 2000)

[24] San Diego State University generation II controller Robert Leach, Frank Beale and James Eriksen Dept. of Astronomy, MS 1221, San Diego State University

[25] Valuation and Pricing of Technology Based Intellectual Property, Richard Razgaitis, 2003, John Wiley & Sons Inc.

Idx 18. In-License Opportunity

For portfolio expansion through in-licensing: this index rates the relative number of high interest but unassigned enforceable patents within the 100 most relevant. In most cases, when these patents are identified within the PFI Report technology sphere, they are of a rather high quality, and could represent very high value in-licensing or acquisition opportunities.

(Idx 19 and Idx 20 reserved for future use)

Idx 21. Technology Advancement

This patent factor bar indicates whether this patent is a small incremental step, or a significant leap over the technology disclosed in the 100 most closely related patents.[26]

Idx 22. Technical Sophistication

A higher number of forward citations to this patent, when compared to the 100 most relevant patents, indicates a higher level of technical sophistication.[27] Technical sophistication is operationalized by forward citations. The number of forward citations a patent receives correlates positively with its technological importance, as measured by expert opinions, social value, and industry awards, as well as to an increased economic value of the invention.

Idx 23. Combinatorial Accession

The higher the number of primary classifications within the top 100 most relevant that differ from the present invention, the more diffused the core technology is.[28][29] Following KSR, a core technology that is ultimately diffused across a broad range of technologies and industries enjoys a high/ higher opportunity for commercialization and generation of licensing revenue.

Idx 24. Technology Cogency

More inventors listed on the present patent, when compared to the 100 most relevant patents, argue in favor of a stronger, more substantial and persistent technology (cogency).

[26] An analysis of the source of EPO citations: applicant vs patent examiner citations; Applied Econometrics Association, by Criscuolo, Geuna & Verspagen, 2004

[27] *Science As A Map In Technological Search Lee Fleming And Olav Sorenson, Strategic Management Journal Strat. Mgmt. J., 25: 909–928 (2004)*

[28] "Combinatorial innovation" IBM Symposium on the Coevolution of Technology-Business Innovations Innovation, Components and Complements, Hal R. Varian, University of California, Berkeley October 5, 2003

[29] Trends of Engineering System Evolution, INNOVAZIONE, (2003) Sergei Ikovenko, Chief Specialist of Invention Machine Corporation

PANEL 1.

In order to examine the significance of the variables used the model, basic correlations analysis was done to examine the relationship of the scoring variables, Total Score, Total Legal Score, Commercial Score, and Total Technology Score to selected Variables. Using Pearson's product moment correlation for use for interval data, the scores of the significant variables were identified. The tables below include only the significant variables greater than -0.2 and +0.2, with most significant shown in ***Bold Italics***. The following tables report the Pearson test:

Total Score

Scoring Variable	Pearson's Score
Uncited	-0.376
Unassign	0.405
Owned	0.405
Idx 5	***0.419***
Idx 6	0.393
Idx 7	0.23
Idx 11	0.265
Idx 14	0.229
Idx 16	0.406
Idx 17	***0.465***
Idx 18	0.336
Idx 22	0.25
Idx 23	0.337

Commercial Score

Scoring Variable	Pearson's Score
Uncited	-0.218
Unassign	0.308
Owned	0.22
Idx 2	***0.335***
Idx 5	0.283
Idx 6	***0.315***
Idx 7	0.225
Idx 16	0.22
Idx 17	0.238

Legal Score

Scoring Variable	Pearson's Score
#DOM	0.279
Uncited	-0.313
Unassign	0.42
Owned	***0.569***
Idx 2	0.324
Idx 3	-0.307
Idx 4	-0.29
Idx 5	0.295
Idx 6	0.266
Idx 12	0.298
Idx 13	0.203
Idx 14	0.302
Idx 16	***0.678***
Idx 17	0.74
Idx 18	0.458
Idx 21	-0.232
Idx 23	0.214

Tech Score

Scoring Variable	Pearson's Score
Uncited	-0.249
Fwd CI	0.512
#Inv	0.286
Idx 5	0.244
Idx 11	0.744
Idx 22	***0.806***
Idx 23	***0.793***
Idx 24	0.324

TABLE 2.

Pre-KSR Patents

Patents used in this analysis, and adjudged in the US Court of Appeals for the Federal Circuit between and including October 1, 1982 and April 30, 2007 (Pre-KSR). However, patents granted prior to January 1, 1976 are not digitally published by the US Patent and Trademark Office, and were not available for Patent Factor Index Quality analysis by PatentCafe's engine. Patents in which one or more claims were either held valid or invalid are noted as "held Valid" or "held Invalid" respectively:

3952144: held Valid
4029233: held Valid
4135202: held Valid
4290064: held Valid
4290063: held Valid
4322895: held Valid
4363350: held Valid
4380893: held Valid
4407288: held Valid
4428194: held Valid
4445456: held Valid
4511811: held Valid
4519505: held Valid
4525352: held Invalid
4529720: held Invalid
4537375: held Valid
4560552: held Invalid
4562181: held Valid
4588580: held Valid
4621077: held Valid
4636214: held Valid
4652321: held Invalid
4652259: held Invalid
4659716: held Invalid
4673829: held Valid
4682155: held Valid
4703359: held Valid
4721168: held Valid
4721723: held Invalid
4739762: held Valid
4771733: held Invalid
4786505: held Valid
4785822: held Valid
4803081: held Valid
4820833: held Valid
4837635: held Invalid
4850236: held Valid
4850960: held Invalid
4853230: held Valid
4866349: held Invalid
4870287: held Invalid
4872296: held Invalid
4879303: held Invalid
4901221: held Valid
4900659: held Invalid
4914568: held Valid
4940658: held Valid
4971998: held Valid
4980281: held Invalid
4981797: held Valid
4988515: held Valid
4988621: held Invalid
5022253: held Valid
5045268: held Valid
5045172: held Invalid
5056578: held Invalid
5066549: held Invalid
5073484: held Valid
5081400: held Invalid
5110046: held Valid
5112311: held Invalid
5126156: held Invalid
5139368: held Invalid
5164316: held Valid
5169242: held Invalid
5171107: held Invalid
5186347: held Valid
5196525: held Valid
5197731: held Invalid
5221141: held Valid
5222985: held Valid
5229382: held Valid
5234288: held Invalid
5244797: held Valid
5248505: held Invalid
5260581: held Invalid
5266464: held Invalid
5273995: held Invalid
5284210: held Invalid
5287776: held Valid
5301336: held Valid
5312550: held Invalid
5322938: held Valid
5336264: held Invalid
5352605: held Valid
5367726: held Valid
5369704: held Invalid
5374564: held Invalid
5382714: held Valid
5408749: held Valid
5409693: held Invalid
5413184: held Valid
5410856: held Invalid
5429455: held Invalid
5457621: held Invalid
5456669: held Invalid
5458414: held Valid
5474831: held Valid
5474555: held Valid
5476778: held Valid
5482289: held Invalid
5486553: held Valid
5518492: held Invalid
5523948: held Invalid
5539027: held Valid
5547933: held Invalid
5561236: held Invalid
5567085: held Invalid
5567056: held Invalid
5574063: held Invalid
5586992: held Invalid
5589984: held Valid
5596656: held Valid
5597213: held Invalid
5612054: held Invalid
5615532: held Invalid
5618698: held Valid
5633015: held Valid
5633352: held Invalid
5632888: held Invalid
5637320: held Valid
5654162: held Valid
5655545: held Invalid
5658261: held Invalid
5662612: held Invalid
5668005: held Valid
5670671: held Valid
5670264: held Invalid
5673989: held Valid
5679376: held Invalid
5681329: held Valid
5681358: held Invalid
5688655: held Invalid
5697882: held Valid
5697536: held Invalid
5710835: held Invalid
5709489: held Invalid
5711752: held Valid
5716641: held Invalid
5733303: held Invalid
5756349: held Valid
5761605: held Invalid
5763047: held Valid
5767372: held Valid
5799151: held Valid
5804112: held Valid
5815639: held Invalid
5820301: held Invalid
5845265: held Valid
5853056: held Valid
5862312: held Valid
5867977: held Invalid
RE36098: held Valid
5878186: held Invalid
5877007: held Invalid
5879370: held Valid
5884256: held Invalid
5887273: held Invalid
5884403: held Invalid
RE36200: held Invalid
5900514: held Valid
5912541: held Valid
5926792: held Valid
5926787: held Invalid
5928197: held Invalid
5932624: held Invalid
5930990: held Invalid
5940800: held Invalid
5938799: held Invalid
5947665: held Valid
5949952: held Invalid
5951927: held Valid
5952027: held Invalid
5970141: held Invalid
RE36355: held Valid
5972018: held Invalid
5988159: held Valid
5990176: held Invalid
5994329: held Invalid
5997553: held Valid
6006291: held Valid
6014643: held Invalid
6014137: held Invalid
6013281: held Invalid
6017855: held Valid
6023675: held Invalid
6026395: held Invalid
6031093: held Invalid

6030790: held Invalid
RE36639: held Invalid
6048977: held Invalid
6048850: held Invalid
6051703: held Invalid
6053845: held Valid
6054561: held Invalid
6063608: held Valid
6065634: held Valid
6076094: held Valid
6085176: held Invalid
6101816: held Invalid
6107546: held Valid
6108703: held Invalid
6110237: held Valid
6113660: held Valid
6113944: held Invalid
6124355: held Invalid
6125949: held Valid
6149055: held Invalid
6152063: held Invalid
6157850: held Valid
6169878: held Invalid
6180061: held Valid
6218380: held Invalid
6244781: held Invalid
6251207: held Invalid
6263222: held Valid
6263215: held Invalid
6270828: held Invalid
6274755: held Valid
6282510: held Invalid
6306382: held Valid
6343476: held Invalid
6357620: held Invalid
RE37602: held Valid
6396273: held Invalid
6398548: held Invalid
6405182: held Invalid
6436015: held Invalid
6520862: held Valid
6554611: held Invalid
RE38119: held Valid
6605646: held Invalid
6615814: held Invalid
6680396 Invalid

TABLE 3.

Post-KSR Patents

Patents used in this analysis, and adjudged in the US Court of Appeals for the Federal Circuit between and including May 1, 2007 and September 30, 2008 (Post-KSR). Patents in which one or more claims were either held valid or invalid are noted as “held Valid” or “held Invalid” respectively:

4354125: held Valid
4687777: held Valid
4743450: held Valid
4743902: held Valid
4914436: held Valid
4739762: held Valid
4959699: held Valid
4817951: held Valid
4513006: held Valid
4579530: held Valid
4701954: held Valid
4786505: held Valid
4853230: held Valid
4674112: held Valid
4786505: held Valid
4853230: held Valid
4804663: held Valid
4767708: held Invalid
5004681: held Valid
5061722: held Valid
5109181: held Valid
5117063: held Valid
5192553: held Valid
5231253: held Valid
5259703: held Valid
5283422: held Valid
5332322: held Valid
5343970: held Valid
5401741: held Valid
5502989: held Valid
5579845: held Valid
5584023: held Valid
5608111: held Valid
5628338: held Valid
5718298: held Valid
5721832: held Valid
5799273: held Valid
5813861: held Valid
5870456: held Valid
5913685: held Valid
5195984: held Valid
5846704: held Valid
5580718: held Valid
5545565: held Valid
5767372: held Valid
5254799: held Valid
5931839: held Valid
5352605: held Valid
5888038: held Valid
5553864: held Valid
5415398: held Valid
5130767: held Valid
5008725: held Valid
5740994: held Valid
5293615: held Valid
5809125: held Invalid
5812650: held Invalid
5466823: held Valid
5760068: held Invalid
5187645: held Valid
5471593: held Valid
5949636: held Invalid
5740801: held Invalid
5404505: held Invalid
5464709: held Invalid
5649131: held Valid
5631127: held Valid
5958717: held Invalid
5038254: held Valid
5568779: held Invalid
5682964: held Valid
5983543: held Valid
5732136: held Valid
5926792: held Valid
5755519: held Invalid
5110493: held Valid
5045552: held Invalid
5737054: held Invalid
6044471: held Valid
6068770: held Valid
6116457: held Valid
6279033: held Valid
6357065: held Valid
6378907: held Valid
6463700: held Valid
6526321: held Valid
6602502: held Valid
6785825: held Valid
7013298: held Valid
6308059: held Valid
6788925: held Invalid
6484203: held Valid
6708212: held Valid
6321338: held Valid
6711615: held Invalid
6991104: held Valid
6336018: held Invalid
6107546: held Valid
6887832: held Valid
6233389: held Valid
6425825: held Valid
6154544: held Invalid
6332215: held Valid
7118245: held Valid
6093102: held Valid
6105007: held Valid
6148377: held Valid
6125565: held Valid
6298589: held Invalid
6631576: held Valid
6843011: held Valid
6905660: held Valid
6049928: held Valid
6045378: held Valid
6009169: held Valid
6512828: held Valid
6064756: held Valid
6064757: held Invalid
6298974: held Valid
6161099: held Valid
6490836: held Valid
6874292: held Valid
6928779: held Valid
6012811: held Valid
6092896: held Invalid
6785400: held Valid
5127760: held Valid
5445625: held Valid
6083213: held Valid
6475195: held Valid
6948622: held Valid
6755518: held Valid
6202649: held Valid
6425401: held Valid
6411531: held Valid
5132895: held Invalid
5680300: held Valid
5411474: held Valid
6068609: held Valid
5824100: held Invalid
5073484: held Invalid
5453425: held Valid
5616578: held Valid
5126270: held Valid
6017745: held Valid
6375104: held Valid
5487069: held Invalid
5682379: held Valid
6359872: held Valid
6374311: held Valid
6583675: held Valid
6714983: held Valid
6847686: held Valid
5657317: held Invalid
6389010: held Valid
5341457: held Valid
5627938: held Valid
6007609: held Valid
6045115: held Valid
5937895: held Valid
6887832: held Valid
5553864: held Valid
6425825: held Valid

TABLE 3.

Partial list of Patent Factor Index (PFI) scores for Pre-KSR patents. Legal, Commercial, and Tech category columns below are merely mathematical averages of the more granular indices comprising each section. The relative scoring scale range is: *(best)* [**1000 / 750 / 500 / 250 / 0**] *(worst)*.

Applicant	Patent Nbr	Pat Validity	Total	Legal	Commercial	Tech
Faxon Communications Corporation	3952144	Valid	250	0	250	750
Sparton Corporation	4029233	Valid	250	0	500	500
Communications Patents Limited	4135202	Valid	500	0	500	750
Harris Data Communications Inc	4290064	Valid	250	0	250	500
Harris Data Communications Inc	4290063	Valid	500	0	500	750
Not Assigned	4322895	Valid	500	0	750	750
Not Assigned	4363350	Valid	500	0	750	500
The Garrett Corporation	4380893	Valid	500	0	500	750
Mieczyslaw	4407288	Valid	500	0	500	750
The Garrett Corporation	4428194	Valid	500	0	500	750
Engineered Products Company	4445456	Valid	500	0	500	750
Seeq Technology Inc	4511811	Valid	250	0	500	500
Diamond Automations Inc	4519505	Valid	500	0	750	500
Beecham Group p l c	4525352	Invalid	250	0	250	750
Beecham Group p l c	4529720	Invalid	250	0	250	500
Ford Aerospace &Communications C	4537375	Valid	500	0	500	750
Beecham Group p l c	4560552	Invalid	250	0	250	500
GlaxoSmithKline	4562181	Valid	500	0	500	750
Alza Corporation	4588580	Valid	500	0	500	1000
Istituto Gentili S p A	4621077	Valid	500	0	500	750
Not Assigned	4636214	Valid	500	0	500	750
Duro-Last Roofing Inc	4652321	Invalid	500	0	500	750
Not Assigned	4652259	Invalid	500	0	500	750
Schering Corporation	4659716	Invalid	500	0	500	750
Seeq Technology Inc	4673829	Valid	500	0	500	750
Central Security Mfg Corp	4682155	Valid	250	0	500	500
NAP Consumer Electronics Corp	4703359	Valid	500	0	500	750
Not Assigned	4721168	Valid	500	0	750	750
Beecham Group p l c	4721723	Invalid	500	0	500	750
Expandable Grafts Partnership	4739762	Valid	500	0	750	750
Not Assigned	4771733	Invalid	500	0	750	750
Aktiebolaget Hassle	4786505	Valid	500	0	500	750
Utah Medical Products Inc	4785822	Valid	250	0	500	500
Aktiebolaget Hassle	4803081	Valid	500	0	500	750
GlaxoSmithKline	4820833	Valid	500	0	500	750
Hewlett-Packard Development Comp	4837635	Invalid	500	0	750	750
Eaton Corporation	4850236	Valid	500	0	750	750
Not Assigned	4850960	Invalid	500	0	750	750
Aktiebolaget Hassle	4853230	Valid	500	0	750	750
The Board of Trustees of the Uni	4866349	Invalid	500	0	500	750
Loma Linda University Medical Ce	4870287	Invalid	500	0	750	750
Duro-Last Roofing Inc	4872296	Invalid	500	0	750	750
Pfizer Inc	4879303	Invalid	500	0	500	750
National Instruments Inc	4901221	Valid	500	0	500	750
Enzo Biochem Inc	4900659	Invalid	500	0	500	750
National Instruments Inc	4914568	Valid	500	0	500	750
University Patents Inc	4940658	Valid	500	0	500	750
Massachusetts Institute of Techn	4971998	Valid	500	0	750	500
Not Assigned	4980281	Invalid	500	0	750	750
Life Technologies Inc	4981797	Valid	250	0	250	750
The Regents of the Univ of Calif	4988515	Valid	500	0	500	750
La Jolla Cancer Research Foundat	4988621	Invalid	500	0	750	750
Mass-Tex Company Ltd	5022253	Valid	500	0	500	750

Not Assigned	5045268	Valid	250	0	500	500
Princeton Biochemicals Inc	5045172	Invalid	500	0	500	750
Not Assigned	5056578	Invalid	250	0	500	500
Armco Inc	5066549	Invalid	500	500	500	500
Bio-Metric Systems Inc	5073484	Valid	500	500	500	750
The Board of Trustees of the Uni	5081400	Invalid	750	750	500	750
McKay Australia Limited	5110046	Valid	750	750	750	500
Utterberg; David S	5112311	Invalid	500	750	500	500
Not Assigned	5126156	Invalid	1000	1000	1000	750
A B Chance Company	5139368	Invalid	750	750	750	750
The University of British Columb	5164316	Valid	500	500	500	500
General Motors Corporation	5169242	Invalid	500	750	500	500
A B Chance Company	5171107	Invalid	750	750	750	750
Not Assigned	5186347	Valid	750	750	750	750
University of British Columbia	5196525	Valid	500	750	250	750
Not Assigned	5197731	Invalid	750	500	750	750
Lamps Plus Inc	5221141	Valid	750	1000	750	750
Not Assigned	5222985	Valid	750	1000	500	500
Lilly Industries Limited	5229382	Valid	500	500	500	750
State Paving Corporation	5234288	Invalid	750	1000	500	500
Life Technologies Inc	5244797	Valid	500	750	250	750
McNeil-PPC Inc	5248505	Invalid	500	500	500	500
Loma Linda University Medical Ce	5260581	Invalid	750	1000	500	750
ICT Pharmaceuticals Inc	5266464	Invalid	750	750	500	750
Warner-Lambert Company	5273995	Invalid	750	750	500	750
Not Assigned	5284210	Invalid	1000	1000	1000	750
Lisle Corporation	5287776	Valid	750	1000	500	500
National Instruments Inc	5301336	Valid	500	500	500	750
Not Assigned	5312550	Invalid	750	1000	750	750
Monsanto Company	5322938	Valid	750	1000	500	750
Norian Corporation	5336264	Invalid	750	750	750	750
Monsanto Company	5352605	Valid	500	250	750	750
Not Assigned	5367726	Valid	750	750	1000	750
Engate Incorporated	5369704	Invalid	500	500	500	750
Commissariat a l'Energie Atomiqu	5374564	Invalid	750	1000	750	750
The Catholic University of Ameri	5382714	Valid	500	500	500	750
Izumi Products Company	5408749	Valid	500	500	500	250
Not Assigned	5409693	Invalid	750	500	750	750
Not Assigned	5413184	Valid	750	750	1000	750
Highland Supply Corporation	5410856	Invalid	500	0	750	750
State Paving Corporation	5429455	Invalid	750	1000	500	500
ABB Power T&D Company Inc	5457621	Invalid	750	750	500	750
Liebel-Flarsheim Company	5456669	Invalid	750	750	750	500
Great Lakes Aqua Sales and Servi	5458414	Valid	750	750	750	500
Not Assigned	5474831	Valid	1000	1000	1000	750
Cross Medical Products	5474555	Valid	750	750	500	750
Boehringer Ingelheim Animal Heal	5476778	Valid	500	500	250	1000
Gary Weingardt Trust a Nevada Tr	5482289	Invalid	750	1000	500	500
Andersen Corporation	5486553	Valid	750	500	1000	750
Not Assigned	5518492	Invalid	750	750	750	500
Not Assigned	5523948	Invalid	750	1000	750	750
Andersen Corporation	5539027	Valid	750	750	750	750
Kirin-Amgen Inc	5547933	Invalid	500	500	500	750
Plant Genetic Systems	5561236	Invalid	500	500	500	750
Not Assigned	5567085	Invalid	750	750	750	500
General Motors Corporation	5567056	Invalid	750	1000	500	500
Not Assigned	5574063	Invalid	750	500	750	750
BASF Aktiengesellschaft	5586992	Invalid	750	750	500	1000
Mirror Lite of North Carolina	5589984	Valid	500	750	500	500
Xerox Corporation	5596656	Valid	750	1000	750	500
Lacks Industries Inc	5597213	Invalid	750	750	750	750
McNeil-PPC Inc	5612054	Invalid	500	1000	250	250
Southpac Trust International Inc	5615532	Invalid	500	0	750	500

Kirin-Amgen Inc	5618698	Valid	500	250	500	750
Not Assigned	5633015	Valid	500	500	500	750
Novo Nordisk A/S	5633352	Invalid	500	500	500	750
Dandy Enterprises Limited	5632888	Invalid	750	750	750	750
Elan Corporation PLC	5637320	Valid	500	750	500	500
Bio-Metric Systems Inc	5654162	Valid	500	250	500	750
Not Assigned	5655545	Invalid	750	1000	500	500
Liebel-Flarsheim Company	5658261	Invalid	500	750	500	500
Liebel Flarsheim Company	5662612	Invalid	500	500	500	500
Life Technologies Inc	5668005	Valid	500	500	500	750
Brantford Chemicals Inc	5670671	Valid	500	1000	500	250
Shertech Inc	5670264	Invalid	750	750	750	500
Not Assigned	5673989	Valid	750	1000	750	500
McNeil-PPC Inc	5679376	Invalid	250	250	250	500
Not Assigned	5681329	Valid	750	750	750	500
Bloom & Kreten	5681358	Invalid	750	500	750	750
ICT Pharmaceuticals Inc	5688655	Invalid	500	500	500	750
Arthrocare Corporation	5697882	Valid	500	750	250	750
Arthrocare Corporation	5697536	Invalid	500	750	250	750
The Regents of the University of	5710835	Invalid	750	750	500	750
Not Assigned	5709489	Invalid	750	750	750	500
Not Assigned	5711752	Valid	750	500	750	750
McNeil-PPC Inc	5716641	Invalid	500	500	500	250
Medinol Ltd	5733303	Invalid	750	750	750	750
Amgen Inc	5756349	Valid	500	250	500	750
Northpoint Technology Ltd	5761605	Invalid	750	750	750	750
Olympic General Corporation	5763047	Valid	500	500	500	500
Plant Genetic Systems N V	5767372	Valid	500	250	500	750
Not Assigned	5799151	Valid	1000	1000	1000	750
Olympic General Corporation	5804112	Valid	500	500	500	250
Engate Incorporated	5815639	Invalid	500	750	500	500
Not Assigned	5820301	Invalid	750	1000	750	500
MercExchange L L C	5845265	Valid	500	500	500	750
Not Assigned	5853056	Valid	750	750	1000	750
Seachange Technology Inc	5862312	Valid	500	500	500	750
The Dow Chemical Company	5867977	Invalid	500	250	500	750
VLT Corporation	RE36098	Valid	250	0	500	0
Engate Incorporated	5878186	Invalid	750	750	500	750
ICT Pharmaceuticals Inc	5877007	Invalid	500	500	500	750
Not Assigned	5879370	Valid	750	500	750	750
Engate Incorporated	5884256	Invalid	500	500	500	750
Not Assigned	5887273	Invalid	750	500	1000	500
Not Assigned	5884403	Invalid	750	1000	750	500
Sensitech Inc	RE36200	Invalid	250	0	500	0
Elf Atochem S A	5900514	Valid	500	500	500	250
Not Assigned	5912541	Valid	750	750	1000	750
Bancorp Services Inc	5926792	Valid	500	500	500	750
Engate Incorporated	5926787	Invalid	500	250	500	500
Liebel-Flarsheim Company	5928197	Invalid	500	500	750	500
Not Assigned	5932624	Invalid	750	750	750	500
The Dow Chemical Company	5930990	Invalid	750	750	750	750
Engate Incorporated	5940800	Invalid	500	250	500	500
Maryland Patent Holdings LLC	5938799	Invalid	500	500	500	500
High Concrete Structures	5947665	Valid	750	750	500	750
Engate Incorporated	5949952	Invalid	500	500	750	500
Marley Mouldings Inc	5951927	Valid	750	750	750	500
Swift-Eckrich Inc	5952027	Invalid	500	750	500	500
Engate Incorporated	5970141	Invalid	500	250	500	500
Not Assigned	RE36355	Valid	250	250	750	0
Medinol Ltd	5972018	Invalid	500	500	750	500
Not Assigned	5988159	Valid	750	1000	500	500
Abbott Laboratories	5990176	Invalid	500	250	500	750
Merck	5994329	Invalid	500	250	500	750

Not Assigned	5997553	Valid	500	500	750	500
Intel Corporation	6006291	Valid	500	500	500	750
Not Assigned	6014643	Invalid	750	500	1000	750
Multimedia AdVentures	6014137	Invalid	750	750	500	750
Astra Aktiebolag	6013281	Invalid	500	500	250	750
BJ Services Company	6017855	Valid	500	500	500	750
Engate Incorporated	6023675	Invalid	500	500	500	750
Engate Incorporated	6026395	Invalid	500	250	500	500
GlaxoSmithKline	6031093	Invalid	250	500	250	250
Haemopep Pharma GmbH	6030790	Invalid	500	250	500	750
North American Container Inc	RE36639	Invalid	250	250	250	0
GlaxoSmithKline	6048977	Invalid	500	500	250	500
Not Assigned	6048850	Invalid	750	500	750	750
GlaxoSmithKline	6051703	Invalid	500	500	500	250
Jumpsport LLC	6053845	Valid	750	500	750	750
Chiron Corporation	6054561	Invalid	500	250	500	750
Life Technologies Inc	6063608	Valid	750	750	500	750
Crown Cork &Seal Technologies Co	6065634	Valid	750	500	750	750
Io Research Pty Limited	6076094	Valid	500	250	500	750
MercExchange LLC	6085176	Invalid	500	250	500	750
Advanced Technology Materials In	6101816	Invalid	750	500	750	750
Aventis	6107546	Valid	250	0	500	250
Massachusetts Institute of Techn	6108703	Invalid	500	250	500	750
Leonard	6110237	Valid	250	0	500	250
Leonard	6113660	Valid	250	250	500	250
GlaxoSmithKline	6113944	Invalid	500	750	750	250
Not Assigned	6124355	Invalid	500	0	750	750
Not Assigned	6125949	Valid	750	750	1000	500
Not Assigned	6149055	Invalid	500	250	750	750
Old Town Canoe Co	6152063	Invalid	500	750	500	250
Masimo Corporation	6157850	Valid	500	0	500	750
Northpoint Technology Ltd	6169878	Invalid	750	1000	750	750
CytoLogix Corporation	6180061	Valid	500	0	750	750
GlaxoSmithKline	6218380	Invalid	500	500	500	500
Hero Products Inc	6244781	Invalid	750	750	750	500
Kimberly-Clark Worldwide Inc	6251207	Invalid	500	0	750	750
Masimo Corporation	6263222	Valid	500	0	750	750
Superconducting Core Technologie	6263215	Invalid	500	500	500	750
Cargrill Incorporated	6270828	Invalid	250	500	250	250
Degussa	6274755	Valid	500	500	500	500
Engate Incorporated	6282510	Invalid	750	750	750	500
Kao Corporation	6306382	Valid	500	250	750	500
Advanced Technology Materials In	6343476	Invalid	500	500	750	500
Not Assigned	6357620	Invalid	750	750	750	500
Medrad Inc	RE37602	Valid	250	0	750	0
Medrad Inc	6396273	Invalid	500	500	500	500
Align Technology Inc	6398548	Invalid	750	500	750	750
Not Assigned	6405182	Invalid	750	750	750	500
Iron Grip Barbell Company	6436015	Invalid	500	750	500	500
Mattel Inc	6520862	Valid	750	500	750	750
Align Technology Inc	6554611	Invalid	500	0	750	750
Mirowski Family Ventures LLC	RE38119	Valid	250	500	250	250
Upsher-Smith Laboratories Inc	6605646	Invalid	250	250	500	250
NPF Limited	6615814	Invalid	750	500	750	750
Cargill Incorporated	6680396	Invalid	250	250	500	250