Patent Portfolio Quality Management

Practical Application of Statistical Patent Quality Analysis of Patent Portfolios for Decision Support in Intellectual Property Management.

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QUALITATIVE PATENT PORTFOLIO MANAGEMENT

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Abstract

With nearly 85% of the market capitalization of the S&P 500 companies being attributable to intellectual property, it goes without saying that effective management of patent portfolios is now a mission-critical responsibility of senior management. Not only does effective portfolio management help CEOs and CFOs meet Sarbanes Oxley reporting requirements, knowledge management of portfolio assets helps executives identify patents that can contribute to bottom line revenue via licensing, cut costs by pruning poor quality patents, develop effective R&D strategies for future products and technologies, support competitive patent strategies, and support M&A decisions.

While the importance of portfolio analysis and management have gone largely unchallenged, the methods of evaluation patent assets has been debated heavily.

By applying a “patent roll-up” approach to statistical evaluation of the qualitative attributes of each patent in a portfolio, this paper explores the application of Portfolio-Xpert™, a Latent Semantic Analysis based statistical evaluation and indices scoring system, as one avenue to objective portfolio evaluation.

Summary

Economists, IP practitioners and business managers have long pursued methods of establishing the value of a patent, and more broadly, a portfolio of patents. The reasons are many, and include damages calculations during litigation, acquisition value, technology due diligence, balance sheet recording and reporting of patent assets, government tracking of the economic impact of research grants, and assessing liquidity of patent asset-backed financing mechanisms, to name a few.

The debate on whether to use Black Shoals, Monte Carlo, or other discounted cash flow methods to compute patent value will continue.

However, rapidly changing market dynamics, increasing global competition in high growth technology sectors, longer patent prosecution, and high impact case law are pressuring patent owners to take a more pro-active approach to effective management of their assets. This creates an immediate need for the deployment of an objective, transparent and highly granular method of evaluating patents and portfolios to support the IP manager's day-to-day decisions.

At any given time, IP managers may need decision support information related to R&D budget planning, litigation response strategy, competitive technology analysis, acquisition analysis, portfolio maintenance cost management, or licensing revenue evaluation. These are questions that simply cannot be answered using a single-value financial model. Rather, an easy to understand, multi-dimensional view of the many qualitative features of a patents contained within a portfolio provide decision-makers with the flexibility of analyzing large portfolios to identify patents that support the present question.

For instance, a patent portfolio will typically contain a large number of patents of nominal quality, and on one end, a smaller number of exceedingly high quality patents, and on the other end, a smaller number of exceedingly low quality patents (standard deviation / Bell Curve). In any given infringement litigation or licensing proceeding, the patent of interest will be either "low" quality, "medium", or nominal quality, or high quality.

In the above instances, management or court decisions can, and often do, correlate directly to financial gains or losses. Understanding the business, technology or legal quality of a patent prior to the decision to involve a particular patent in a proceeding or business process can profoundly affect the outcome, and its financial impacts.

Since the objective of qualitative patent analysis is to provide transparency of key factors that contribute to value, rather than to predict a static economic value, statistical quality information can be leveraged in licensing or other discussions of economic valuation based on the immediate opportunity, creating the most realistic business environment.

By using PatentCafe's Portfolio-Xpert patent analysis software tools as the basis for this paper, we will evaluate individual patents, as well as a collection of patents comprising entire patent portfolios by applying the qualitative analysis of twenty statistically computed indicators contributing to patent value.

The veracity of the statistical process used to compute Patent Factor Index scores, as well as the effective application of patent quality indicators to support the various corporate management objectives will be reviewed in practical scenarios that reflect traditional, day to day analyses encountered by corporate managers responsible for portfolio management.

Evaluating A Patent Portfolio

Portfolio evaluation supports operational decision-making. Without a core understanding of the strengths, weaknesses, opportunities and threats related to the managed patent assets, management is helpless in formulating effective business or legal strategies.

As Garcia[1] suggested, key benefits patent portfolio management include:

- Understand the current patent position of the company in the market
- Perform technological competitor monitoring and technological forecasting
- Leverage the company's decision-making process: where/when to invest
- Create effective defensive tactics

As would be expected by any IP professional, the European Patent Office identified similar benefits of patent portfolio management[2]. As shown in Table 1, the EPO went a little further in suggesting how to practically employ the benefits in an operational environment, and hinted at the degree with which each indicator contributed to the operational decision-making.

Important Patent Metrics (EPO / IPScore®)		
Criterion	**Meaning**	**Effect**
Competitive activity in the technical field	Patent advantage is more valuable when there a lot a of competition	++
IP activity in the technical field	The more active the field the more important it is to have a patents to compete.	++
Ease of implementation	Before generating revenues, an invention must be implemented. Patent protection has less value for complex invention.	++
Applicability of the technology	The technology must find application in a given market.	++
Risk of circumventing the claims / Scope	Patent that are easily circumvented have little value.	--
Patentability of the claims	Patent that risk to be invalidated for patentability have less value.	++
Invalidation risk from prior art	A patent against which relevant prior art can easily be found has less value	--
Risk of infringing other patents	Similar to above	--
Technical reach	The more innovative the more valuable.	++
Geographical Reach	The more countries covered the more valuable.	++

Table 1.

[1] Garcia, Erik; *The Patent Portfolio, 2007*, http://www.lib.uwo.ca/business/The%20Patent%20Portfolio%20v5.doc

[2] Czarik, Damien & McDonald-Maier, Lisa; Seminar on Search and Documentation Working Methods, Patent Information and Decision Making, EPO European Patent Academy, 2006

The EPO's model, which incorporates IPScore®[3], a patent and trademark portfolio evaluation software tool developed by the Danish Patent Office, begins to highlight the importance of multi-dimensional analysis of IP quality. However, the solution (a) does not address the key quality indicators deeply enough to support complex decisions by the IP department, (b) allows the user to establish certain economic parameters, introducing an unacceptable level of subjectivity to enter an objective evaluation model, and (c) broadly supports the valuation of patents *or trademarks*. Both forms of IP rely on important metrics exclusive the either patents or trademarks, and such a broad evaluation model may not fully develop the IP value in either case.

To fully evaluate the quality of a patent, it must be assessed within its own technology domain, and under real world conditions created by competitive activity, density of patents attempting to control a technology domain, impacts of the latest case law on enforceability of patents, and in cases where patent owners maintain a dominant position within a market space, the compounding effect on the value of each patent within a group of patents under common ownership.

A completely non-human assessment of patent quality, and the contribution of the quality level to patent value, ensures consistency, repeatability and objectivity of patent evaluation. Rolling up the evaluation scores of many patents into a large portfolio preserves the granularity needed for deep analytics that support management decisions.

Portfolio-Xpert™ is a portfolio analysis solution that computes more than twenty individual indices contributing to patent quality (Table 2.). These indices are grouped into legal, technology and market / commercial segments since portfolio evaluation is typically relied upon to support decisions that are fairly exclusive to these three parameters. The indices computed for each patent include:

Key Indicators of Patent Value (Computed by PatentCafe® Portfolio-Xpert™)		
Legal Scores	**Commercial Scores**	**Technology Scores**
1: Enforceability	9: Forward Citation Value	17: Technology Advancement
2: Relevancy Strength	10: Backward Citation Value	18: Technical Sophistication
3: Novelty	11: Enforcement Potential	19: Combinatorial Accession
4: Claim Scope Breadth	12: Partnering Potential	20: Technology Cogency
5: Prior Art Validity	13: Crowdedness	Total Aggregate Score
6: Concurrent Art Validity	14: Divestiture Licensing Premium	Total Aggregate Legal Score
7: Sustain Opposition	15: Competitive Position	Total Aggregate Commercial Score
8: Litigation Avoidance	16: In-License Opportunity	Total Aggregate Technology Score

Table 2.

These individual indices are described fully in an earlier paper Explanation of PatentCafe® Patent Factor Index™ Reports[4].

[3] The EPO Acquired IPScore® from the Danish Patent Office in early 2007, but at the time this paper was written, the EPO has yet to re-release the software. http://www.epo.org/patents/law/legal-texts/InformationEPO/archiveinfo/29122006.html

[4] Gibbs, A.; Explanation of PatentCafe® Patent Factor Index™ Reports (PFI), and Practical Application of Statistical Quality Scoring to Commercial Patent Management, a Working Paper, April 2008

Individually, or in various combinations, these indices provide different looks at a portfolio, on demand, in support of myriad questions that managers typically bounce against their patent assets.

Sox Compliance: Portfolio Value Changes In Light Of KSR

Sections 302 and 409 of Sarbanes Oxley (SOX) require, in that public companies report any material decline in value. A loss of intangible asset value, specifically patent value, certainly falls under the purview of SOX.

Sec. 302, Corporate Responsibility for Financial Reports requires the CEO or CFO to report negative material changes in corporate value.

Sec. 409, Real Time Issuer Disclosures requires public companies to rapidly report material changes to corporate value.

In deciding KSR, the Supreme Court changed the long-standing definition of obviousness. The decision has shaken the presumption of validity of granted patents that a company maintains in its portfolio, and correspondingly, the presumed value of corporate patent portfolios.

Following the Supreme Court decision in KSR v. Teleflex (KSR)[5], industry watchers began highlighting the impact KSR would have on patent portfolios owned by technology centric companies. But taken a step further, they raised the issue of CEOs and CFOs to accurately report adverse material changes in patent asset value.

- *Rulings Weaken Patents' Power*[6]
- *Patent Holders' Grip Weakens, High Court Curtails Power Amid Innovation Debate; More Disputes May Arise*[7]
- *High Court Puts Limits on Patents*[8]
- *How Will Sarbanes-Oxley Reporting Be Affected by KSR?*[9]

Before KSR, a survey[10] concluded: " … 86.4 percent of respondents had no idea how their companies value IP, and 41 percent weren't sure if the appraised value of IP was accounted for in the company's balance sheet".

Now, following KSR in more recent reviews, CEOs and CFOs are considerably challenged to argue ignorance of the impact on patent value caused by KSR. The Advocate's Edge noted "Because [KSR] has implications for compliance with the Sarbanes-Oxley Act (SOX) and certain accounting standards, some companies may require new patent valuations."[11]

Previously, I presented a study of the quantitative change in the correlation between statistical indicators of patent quality in CAFC decisions before and after KSR[12]; the differences are stark, and illustrate that a qualitative measurement of patent

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[5] KSR International Co. v. Teleflex, Inc.; http:// www.supremecourtus.gov/opinions/06pdf/04-1350.pdf

[6] Barnes & Sipress, Washington Post, May 1, 2007; Page D01

[7] Bravin, Wall Street Journal, May 1, 2007

[8] Greenhouse, New York Times, May 1, 2007

[9] Peter Zura's 271 Patent Blog, May 1, 2007

[10] Patents: What Are They Worth? Sarbanes-Oxley Changes The Way Companies Value IP, Corporate Legal Times, May 2005, Vol. 15, No 162.

[11] Supreme Court decision could require fresh patent valuations, Advocate's Edge, March/April 2008

[12] Gibbs. A., *Comparison of Statistical Quality Indicators of Patents in CAFC Decisions Before and After KSR V. Teleflex*, a working

value is indeed possible.

The issue does not seem to question corporate reporting responsibilities under KSR, nor the negative impact on patent values caused by the KSR decision. Rather, the issue raises the question as to how patent portfolios are valued, and how to determine material changes in that value resulting from the Supreme Court decision.

Sarbanes Oxley Compliance Journal[13] suggests that companies first complete an inventory, and then, "Determine the Value of Each IP Asset" by performing an evaluation "to make a judgment as to the economic result (i) if the company were unable to use the asset in its business, (ii) if use of the asset were restricted or (iii) if others could use the asset without restriction." Reference to "unable to use the asset" with respect to patents corresponds to a "freedom to operate", and "use of the asset were restricted" implies the inability to enforce the patent should infringement occur. These two criteria are examples of qualitative measurement of patent value.

This paper will explore in more detail how corporations can objectively assess patent quality of very large portfolios. How the results of portfolio evaluation may be reported out to a company's stakeholders will be a matter of accounting and corporate communications policies better left to the individual companies.

paper, May 2008.

13 Intellectual Property and Sarbanes-Oxley: Steps for Implementing IP Best Practices, Sarbanes Oxley Compliance Journal, Dec. 23, 2005

Transparency of Process; Reliability of Ratings Scores

A reliable, statistical patent evaluation process must incorporate the key elements of transparency, repeatability, and objectivity.

The analytical process used for this study was required to:

- Rely entirely on machine processes (no human input of formula variables), and
- Deliver a results set containing multiple data points for each patent, and for the portfolio of patents. Single score rating systems lacked the resolution needed to adequately assess qualitative patent value that would support the diverse IP and business missions encountered in typical corporate operations.

Variable formula based patent scoring systems, such as the previously discussed IPScore®, rely in part on human input of certain financial assumptions, market data, or other variables as a required component to the formula for computing patent value. Whether determining economic or qualitative value, scoring systems that require manual input (a) are not suited to scaling for large portfolio collections, and (b) lack the objectivity to ensure repeatability by a different person (who happens to input different variables. Human input requirements disqualified scoring systems that required manual substitutions of formula variables.

A number of commercial patent evaluation systems are available that correlate the qualitative value of a patent to a single score (e.g.: 95% quality, "A" grade, or "poor / good / better / best"). However, single-score patent rating systems often do not provide the information granularity needed to support the myriad decisions that are made regarding acquisition, divestiture, enforcement, or abandonment of a patent, or a portfolio of patents. Performing each of these functions requires the IP manager or legal professional to look at patent quality from different, sometimes opposing perspectives. Scoring systems that provided no or limited score granularity were disqualified for use in this study.

PatentCafe Patent Factor Index "PFI™" Reports compute 20 key patent quality indicators that have been shown to consistently correlate to patent value. Individually, or in combination with other of the 20 indices, the PFI scores have allow attorneys and IP managers to visualize patent quality in support of their disparate patent asset management objectives.

The PFI Reports rely entirely on machine calculations to compute the statistical scores, and further, provides meaningful and actionable explanation of each index score as it pertains to the patent management decision process within an organization.

In an ongoing effort to improve the transparency and reliability of PFI Reports, continued analysis by third party commercial organizations, financial and academic institutions is underway. Once completed, the results of any ongoing analysis of the veracity of the PFI Reports and processes will be published in the appropriate peer-reviewed journals and articles.[14]

[14] "Gibbs, Andy; "KSR defines new baseline for statistical patent quality"; IAM Magazine, Issue #29, March/April 2008.

Application Of PFI Scores To Portfolio Management

Once Patent Factor Index (PFI) scores are computed for each of the indices outlined in Table 2., we are able to begin visualizing large portfolio collections with the resolution necessary to answer various questions that allow for effective IP management.

The axiom “if you can’t measure it, you can’t manage it” is seldom the guiding principle for portfolio management, primarily because few scoring systems have allowed for high-resolution measurement of patent quality in the first place. By computing scores for a large number of interrelated indices for each patent in a portfolio, it becomes possible to sort a large portfolio based on one or more indices of interest, and identify key patents in support of any given management objective.

For instance, an IP manager can see what patents to potentially prune from a portfolio by identifying patents with the highest Invalidity Risk (if you can’t enforce it, why pay for it?). By re-sorting a portfolio based on Forward Citation Value contribution, an IP manager can quickly see what patents may generate the highest licensing revenue. As an example, the stratification of scores for each quality index across a sample portfolio of 5,000 patents are represented by the bars shown in Fig. 1.

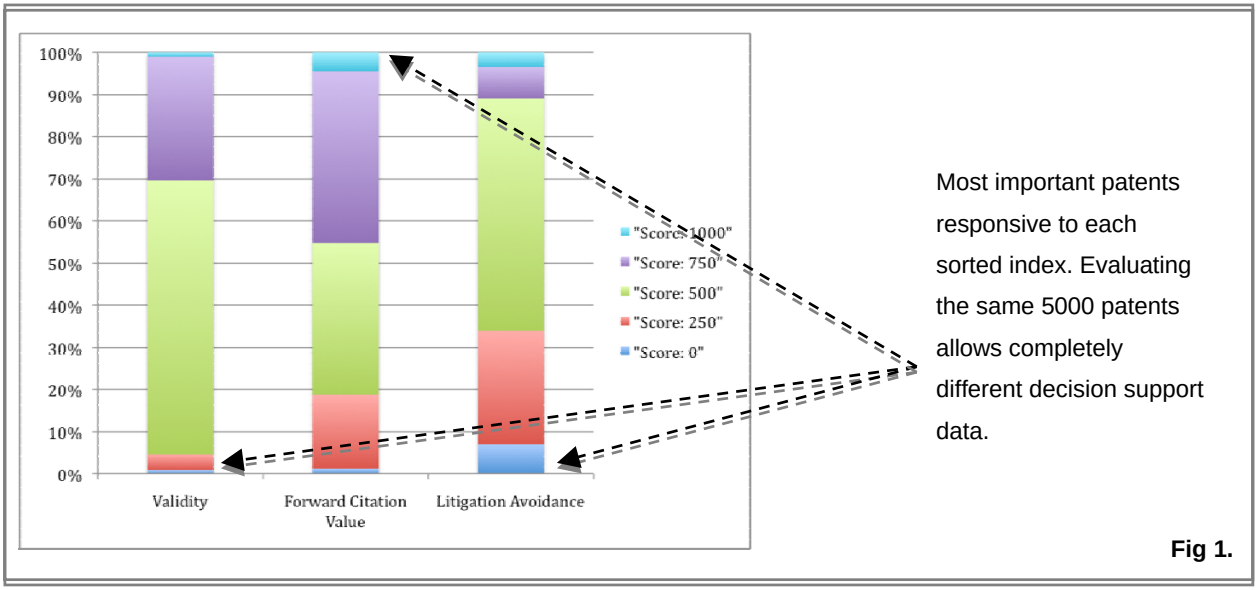


Fig 1.

IP managers can pinpoint the specific group of patents within a particular score strata for off-line analysis, and determine with reasonable precision which patents should be licensed, pruned, or not enforced. The resolution provided by multi-dimensional statistical analysis returns a completely different picture based on what the IP manager asks of the portfolio.

Comparatively, single-score patent rating systems would simply lump patents into bad-good-better-best buckets, regardless of what specific quality characteristics one was trying to identify within the portfolio.

As the questions that portfolio managers ask become more single-solution focused, and more complicated, the necessity of analyzing multiple indices together becomes more apparent. The few examples of multi-dimensional analysis that follow illustrate how different combinations of patent indices provide the flexibility needed to properly extract management information from the qualitative data.

Revenue: Potential for revenue generation

Owners of large portfolios generate revenue from patent licensing. The methodology of applying a multiple index scoring system to a portfolio can help IP managers identify other high value patents for licensing.

- Start the licensing analysis by identifying all patents currently earning the highest licensing revenue. With this collection gathered, the IP manager can review all twenty indices to identify consistently occurring high or low scoring indices common to the majority of patents in this collection. Those indices can thereafter serve as a data mining model used to identify other patents that share similar characteristics.

- Develop a multiple index model based on technical subject matter expertise and knowledge of market, competitors, and business strategy, i.e.: *Prior Art Validity, Concurrent Art Validity, Sustainability in Opposition, Litigation Avoidance, Forward Citation Value, Enforcement Potential, and Competitive Position*

Cost Reduction: Portfolio triage and pruning of poor patents

A portfolio manager tasked with identifying low quality patents, for which continued payment of maintenance fees would be a waste of company resources, can select certain indices that correlate to "poor quality" patents not worthy of continued financial investment. These indices might reasonably include:

- *Validity Confidence*: if the manager has no confidence in the validity of the patents, they will likely never be asserted against an alleged infringer. Therefore, by sorting the entire portfolio in ascending order for indices 5 and 6 (Validity Confidence), the manager can instantly identify the patents with the poorest validity scores, strip them off for independent assessment, and ultimately dispose of them by sale or abandonment.

- *Patent Group Competitive Position*: if the company has a number of "orphan" patents which do not collectively correspond to the company's core business, it can quickly identify those patents by sorting the portfolio based on ascending order for index 17 (Patent Group Competitive Position).

- Combination Sort: by sorting first on *Validity Confidence*, then immediately resorting the patents with the lowest validity confidence by ascending *Patent Group Competitive Position*, the IP manager can now quickly identify the most likely 10, 50 or 100 patents out of a portfolio of 10,000 or more, and take affirmative action on divesting or abandoning patents to cut recurring patent legal costs.

Competition: Competitive Patent Position

- *Analyze In-License Opportunity* scores to identify patents around which closely related, unassigned patents can be more efficiently acquired.
- Sort based on *Relevancy Strength, Partnering Potential, Divestiture Licensing Premium, and Crowdedness* to find patents that hold a more competitive position in the industry.

Market Protection: Identifying infringed patents, assessing litigation risks

- Pioneer patents are those filed early in the emergence of new technologies or markets. Sort patents based on descending evaluation scores *Relevancy Strength, Prior Art Validity, Concurrent Art Validity, Divestiture*

Licensing Premium, and Technology Advancement.

R&D and Patent Strategy: Current patent and market density

- To increase focus on protecting the technology in which a company already has a competitive advantage, and where the company may elect to expand R&D investment in new technology areas, sort patents to find those scoring highest in *Technology Advancement, Technical Sophistication, Combinatorial Accession, Technology Cogency, Divestiture Licensing Premium and Competitive Position*.

SOX Reporting: Correlating portfolio quality with market capitalization

- Analyze averages of all patent indices across the entire portfolio. Create a competitor's portfolio, and score all patent indices. Compare key strengths and weaknesses of both portfolios, and identify any correlations between market cap and the most frequently occurring quality scores.

As these scenarios show, effective information mining of large portfolios is easily accomplished after multiple data points are computed for each patent. The number and types of analysis scenarios are limited only by the type of decision-support information the IP manager seeks.

Analysis of PFI Report scores is accomplished within Portfolio-Xpert™, accessible via standard web browser.

In addition to the twenty PFI report indices outlines in Table 2, Portfolio-Xpert includes additional computed data fields not available in traditional patent bibliographic data.[15]

Following are test cases on portfolios of publicly held US corporations. They illustrate the practical application of PFI Scores to the overall management of large patent portfolios. The screen shots will show the standard user interface, typical search process, analysis, and CSV (Microsoft Excel®) data export.

[15] Portfolio-Xpert™ Web-based Enterprise Portfolio Management Solution: http://www.patentcafe.com/products/patent_portfolio.asp

Portfolio-Xpert™ Evaluation Module

First, the PFI Scores were computed by PatentCafe for each patent that was included in the sample portfolio. As I described in the Patent Factor Indices white paper, the 20 indices for each of the 100 patents within its own technology sphere are computed and compared against the 20 indices the portfolio patent.

Because more than 2,000 data points are computed for each portfolio patent, initial setup for a 5,000 patent portfolio may consume 4 days of 24X7 processing. Thereafter, the development of the evaluation scenarios that follow begins by ticking the check boxes for each of the Patent Factor Indices desired (Fig. 2.).

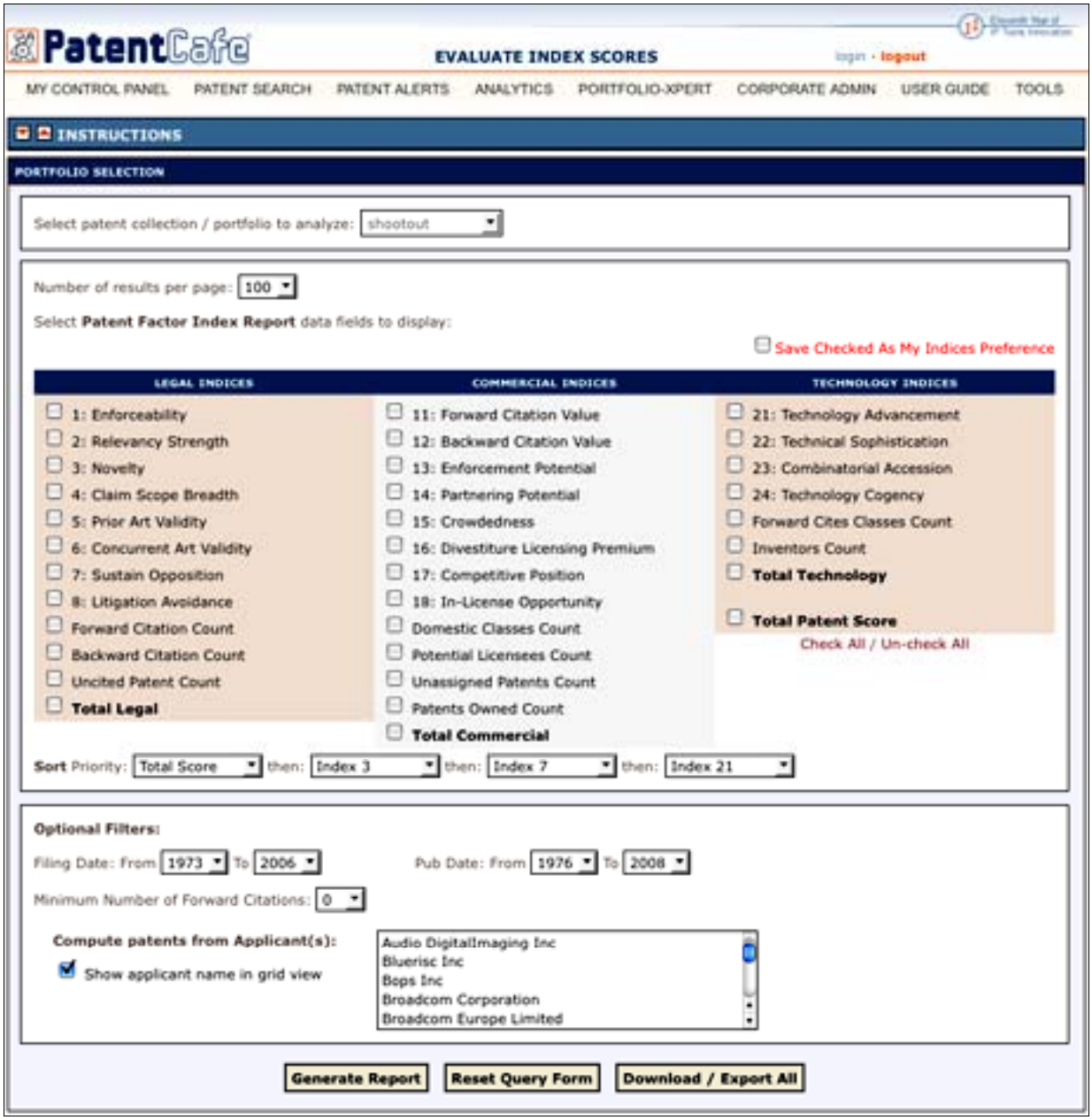


Fig. 2.

Scenario 1: IP Objective - efficiently deepen portfolio quality through patent acquisition

Decision Support Question: How does a company quickly identify the highest quality patent acquisition targets within a given technology space?

IP Management's selection criteria: (Tick the appropriate check boxes to begin sorting):

- defensibility (strong *Validity Confidence*),
- peer acknowledgement (highest *Forward Citation Counts*),
- broadest industry application (*Combinatorial Accession*).

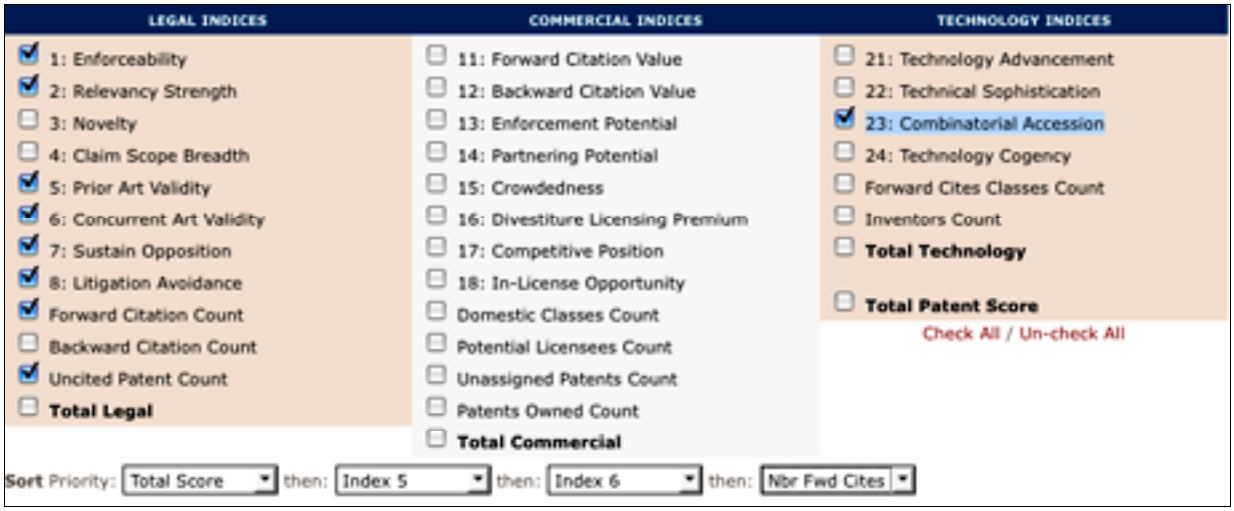
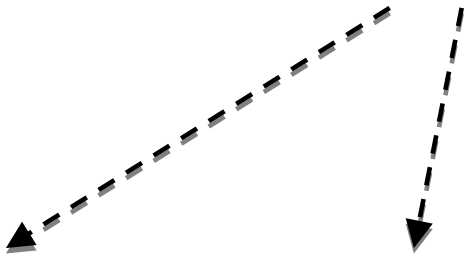
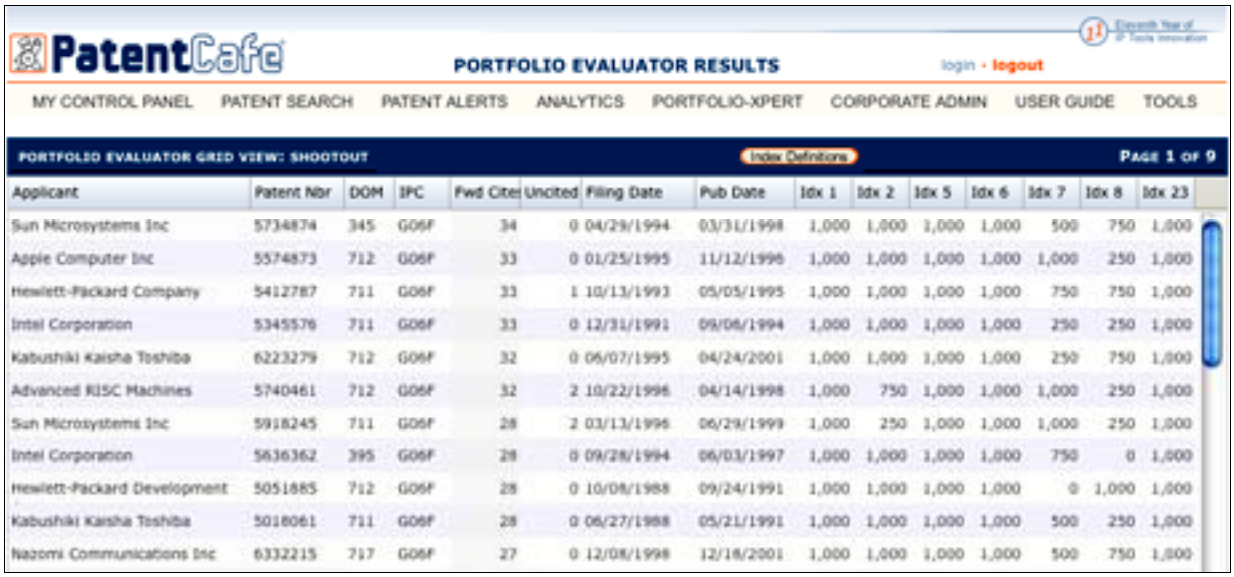


Fig. 3.

The results screen lists more than 869 patents within a narrowly targeted semiconductor technology space showing the patent owners, along with the scores for each index selected. The patents are organized with those with the highest number of *Forward Citations* AND highest *Validity Confidence* at the top (Fig. 4.)





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PORTFOLIO EVALUATOR GRID VIEW: SHOOTOUT — Index Definitions — PAGE 1 OF 9

Applicant	Patent Nbr	DOM	IPC	Fwd Cites	Uncited	Filing Date	Pub Date	Idx 1	Idx 2	Idx 5	Idx 6	Idx 7	Idx 8	Idx 23
Sun Microsystems Inc	5734874	345	G06F	34	0	04/29/1994	03/31/1998	1,000	1,000	1,000	1,000	500	750	1,000
Apple Computer Inc	5574873	712	G06F	33	0	01/25/1995	11/12/1996	1,000	1,000	1,000	1,000	1,000	250	1,000
Hewlett-Packard Company	5412787	711	G06F	33	1	10/13/1993	05/05/1995	1,000	1,000	1,000	1,000	750	750	1,000
Intel Corporation	5345576	711	G06F	33	0	12/31/1991	09/06/1994	1,000	1,000	1,000	1,000	250	250	1,000
Kabushiki Kaisha Toshiba	6223279	712	G06F	32	0	06/07/1995	04/24/2001	1,000	1,000	1,000	1,000	250	750	1,000
Advanced RISC Machines	5740461	712	G06F	32	2	10/22/1996	04/14/1998	1,000	750	1,000	1,000	1,000	250	1,000
Sun Microsystems Inc	5918245	711	G06F	28	2	03/13/1996	06/29/1999	1,000	250	1,000	1,000	1,000	250	1,000
Intel Corporation	5636362	395	G06F	28	0	09/28/1994	06/03/1997	1,000	1,000	1,000	1,000	750	0	1,000
Hewlett-Packard Development	5051885	712	G06F	28	0	10/08/1988	09/24/1991	1,000	1,000	1,000	1,000	0	1,000	1,000
Kabushiki Kaisha Toshiba	5018061	711	G06F	28	0	06/27/1988	05/21/1991	1,000	1,000	1,000	1,000	500	250	1,000
Nazomi Communications Inc	6332215	717	G06F	27	0	12/08/1998	12/18/2001	1,000	1,000	1,000	1,000	500	750	1,000

Fig. 4.

All of the checked scores for each of 869 portfolio patents are then quickly exported as a CSV file, and opened in Excel® to complete a deeper multi-column sort analysis (Table 4.).

Once exported, we sorted the spreadsheet to bring patents with the highest *Forward Citation* (Col. 3) count to the top. This would normally be a reliable barometer showing the highest "value" patents, as shown in Table 3. However, by evaluating multiple indices at once, we see the highly cited patents that also have a high number of uncited prior art patents (Col. 4) and poor *Validity Confidence* (Col. 9 and Col 10.) The cells highlighted in yellow show patents that have a high statistical probability of not withstanding a validity challenge, in part because of the high number of earlier filed, semantically relevant patents found.

Therefore, the highlighted patents, when correlated with additional qualitative data points, appear as POOR acquisition candidates, regardless of the implicit value suggested by the high number of F*orward Citations* alone.

Table 3.

Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 7	Col. 8	Col. 9	Col.10	Col.11	Col.12
Applicant	Pat Nbr	Fwd Cites	Uncited	Filing Date	Idx 1	Idx 2	Idx 5	Idx 6	Idx 7	Idx 8
NexGen Microsystems	5226130	277	4	2/26/90	1000	0	1000	1000	500	0
International Meta Systems Inc	5574927	148	23	3/25/94	1000	0	0	500	1000	750
Motorola Inc	5488688	135	0	3/30/94	1000	1000	1000	1000	750	750
Motorola Inc	5530804	98	3	5/16/94	1000	500	1000	1000	250	750
Sun Microsystems Inc	5255379	98	0	12/28/90	1000	1000	1000	1000	1000	500
International Business Machines	5854913	94	4	6/10/97	1000	750	1000	1000	500	750
International Business Machines	5475856	94	0	10/17/94	1000	1000	1000	1000	1000	750
Patton Electronics Co	6079008	92	49	4/3/98	1000	0	0	0	1000	500
Advanced Micro Devices Inc	5944841	87	0	4/15/97	1000	1000	1000	1000	1000	1000
Cyrix Corporation	5471598	87	15	10/18/93	1000	0	250	500	250	500
Nexgen Microsystems	5163140	77	6	3/2/92	1000	0	1000	750	500	750
Hewlett-Packard Development Comp	5193167	75	15	6/29/90	1000	0	500	250	750	1000
Advanced Micro Devices Inc	5185868	74	11	1/16/90	1000	0	750	500	1000	750
International Business Machines	5357617	73	0	11/22/91	1000	1000	1000	1000	750	500
International Business Machines	4399507	71	0	6/30/81	0	1000	1000	1000	0	750
National Semiconductor Corp	6044478	70	31	5/30/97	1000	0	250	0	1000	500
Advanced Micro Devices Inc	5251306	69	17	1/16/90	1000	0	500	250	1000	750
International Business Machines	5513366	66	16	9/28/94	1000	0	0	750	250	1000
Hewlett-Packard Development Comp	4713755	60	0	6/28/85	0	1000	1000	1000	500	1000
International Business Machines	5446876	59	14	4/15/94	1000	0	250	750	500	750
AT&T Corp	5043870	58	0	7/19/89	1000	1000	1000	1000	750	1000
Chips and Technologies Inc	5455909	57	0	4/22/92	1000	1000	1000	1000	250	750
Sun Microsystems Inc	6035374	52	23	6/25/97	1000	0	500	0	750	0
Exponential Technology Inc	5551001	51	0	6/29/94	1000	750	1000	1000	250	0
Hitachi Ltd	5918045	50	3	10/17/97	1000	750	1000	1000	250	750
Micron Technology Inc	6760833	50	42	8/31/00	1000	0	0	0	1000	750

Continuing the visual analysis, we charted the 869 patents to see how quickly the curve would drop off, roughly highlighting the distribution of patents with the highest number of citations (Fig. 5.). The drop off would be expected, but the graph allows the IP manager to see the overall citation values of all patents within the targeted technology space.

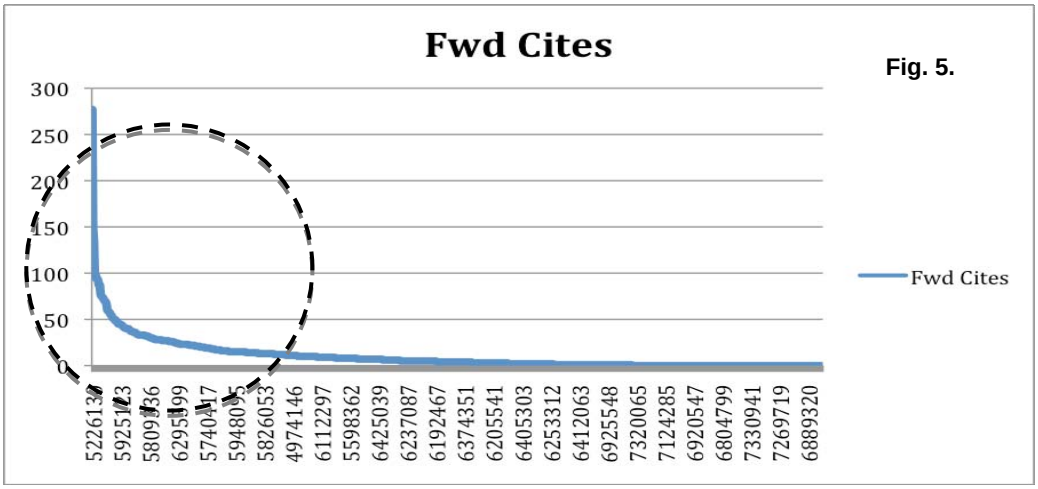


Fig. 5.

By performing a few simple sorts (such as extracting patents with low *Validity Confidence* scores), then graphing the remaining patents based on forward citation count (assuming this index is a primary qualification parameter that supports the patent acquisition strategy), the field of 869 candidates was reduced to less than 25% within the first few minutes.

Of the 869 patents, 241 have *Validity Confidence* scores of 250 or less (out of a total possible score of 1,000). These patents were extracted from the data set, and the remaining patents re-charted based on *Forward Citation* count. By switching to a Scatter Chart option at this point, the available **information increases significantly**. With the patents shown within the patent series (ie: 5,000,000. 6.000,000, 7,000,000), the IP manager now has an approximate time-value along with the forward citation value to identify patents filed early (earlier technology generation), and highly cited, later filed patents. (Fig. 6.) The IP manager may continue conducting other analysis on this data set before reading each patent.

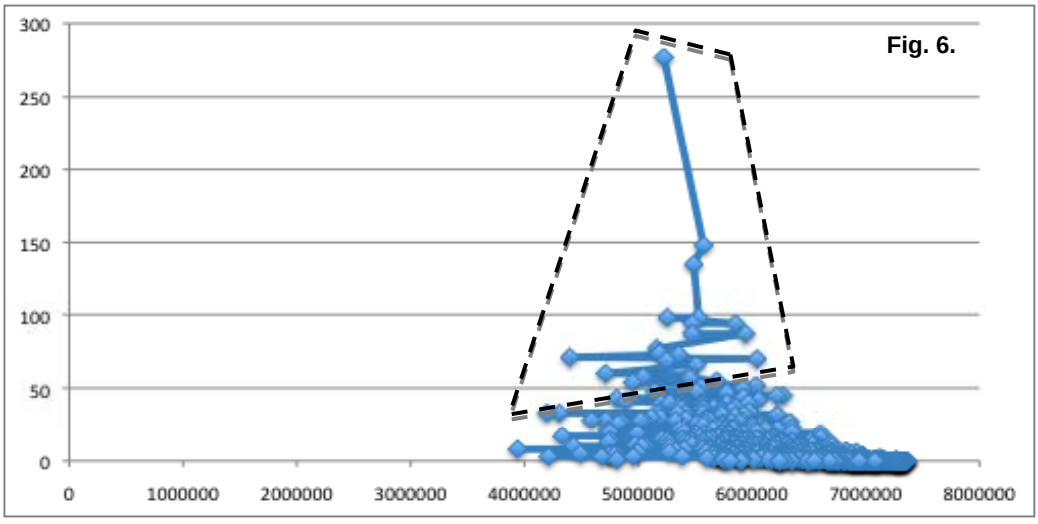


Fig. 6.

As a final process in this acquisition analysis, the remaining patents were sorted one last time showing (a) oldest filing date, and (b) highest validity confidence. With this information, the IP manager can elect to look at patents only 15 years old or less, and develop the **short list of acquisition candidates**. (Table 4.)

Patent Nbr	Fwd Cites	Uncited	Filing Date	Idx 5	Idx 6
3940744	8	0	12/17/73	1000	1000
4212058	3	0	9/20/77	1000	1000
4197579	33	0	6/6/78	1000	1000
4307445	33	1	11/17/78	1000	1000
4332008	17	1	11/9/79	1000	1000
4430708	10	1	5/22/81	1000	1000
4399507	71	0	6/30/81	1000	1000
4491911	5	0	2/24/82	1000	1000
4750110	20	0	4/18/83	1000	1000
4589065	28	1	6/30/83	1000	1000
4679194	3	0	10/4/84	1000	1000
4713755	60	0	6/28/85	1000	1000
4953073	54	1	2/6/86	1000	1000
4736290	13	0	6/13/86	1000	1000
4715013	28	5	7/25/86	1000	750
4731736	21	6	9/18/86	1000	750
4758978	5	4	9/18/86	1000	750
4791559	4	0	11/10/86	1000	1000
4891753	41	0	11/26/86	1000	1000
4811215	43	4	12/12/86	1000	750
4853849	27	14	12/17/86	0	1000
4729094	29	3	3/24/87	1000	750
4758950	14	2	4/13/87	1000	1000
4811274	1	2	9/14/87	1000	1000
4745574	5	1	9/17/87	1000	1000
4744049	4	6	9/17/87	1000	750
4994961	6	11	9/18/87	500	750
4956805	3	0	9/22/87	1000	1000
5274829	6	0	10/28/87	1000	1000
4823260	26	0	11/12/87	1000	1000
4821231	4	5	12/21/87	750	1000
4974146	11	0	5/6/88	1000	1000
5018061	28	0	6/27/88	1000	1000
5031096	10	4	6/30/88	1000	1000
5051885	28	0	10/8/88	1000	1000
5406644	20	0	11/23/88	1000	1000
4991088	19	0	11/30/88	1000	1000
5148533	48	0	1/5/89	1000	1000

Table 4.

** The list in Table 5. was truncated in order to show the top results on this page.*

Other online analysis allows quick visualization of who owns these patents,

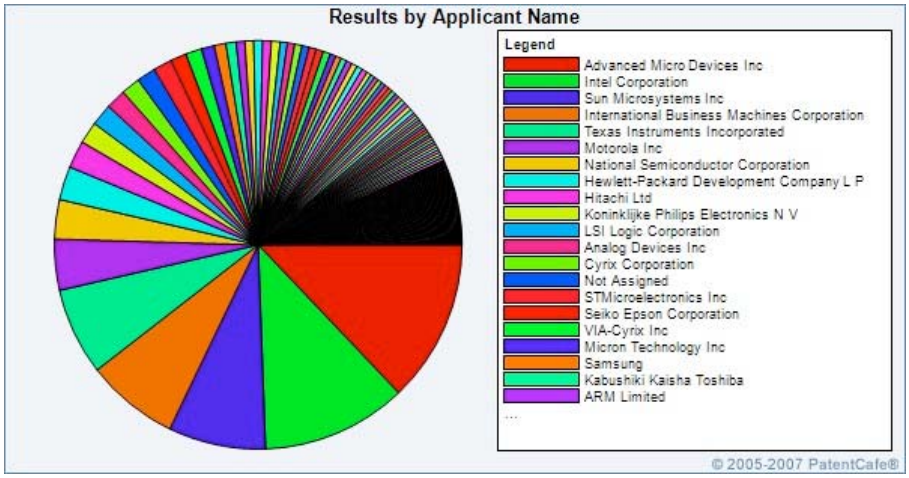


Fig. 7.

how these patents group according to the core technology claimed,

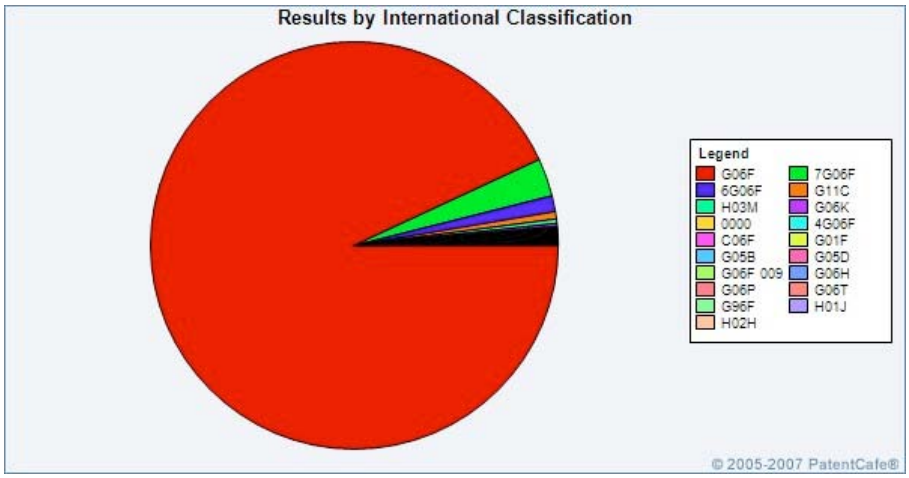


Fig. 8.

and what the filing trend has been for this technology segment.

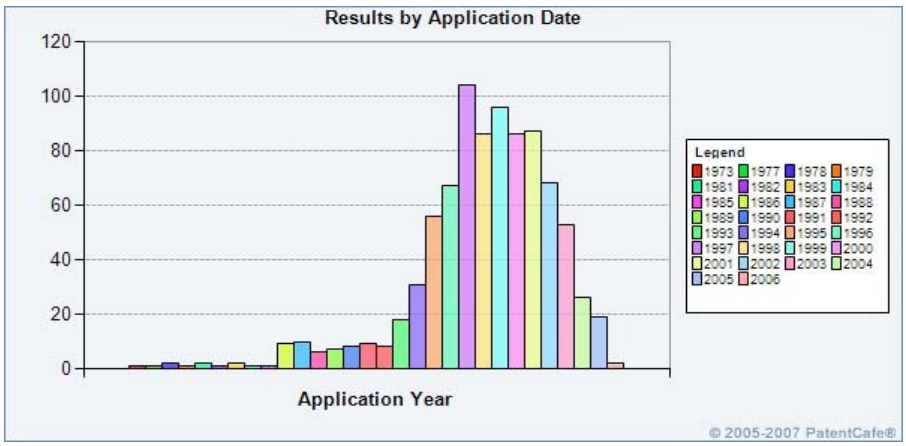


Fig. 9.

The total time to data mine and analyze 869 patents for Scenario 1: about 30 minutes.

Scenario 2: IP Objective - Use Patent Quality Indicators to Organize Large Portfolios

Decision Support Question: Build a portfolio, compute Patent Factor Index scores for all patents, select all, and sort (Fig. 10.). Can this statistical process help management to obtain a high level view of portfolio quality? Can this analysis be used as a quality or performance baseline for future year comparison? The objective is to continually increase shareholder value.

IP Management's criteria for defining patent quality bands within a portfolio:

- *Total Aggregate Legal Score* (broad overview of legal quality)
- *Total Aggregate Commercial Score* (broad overview of licensing / revenue potential)
- *Prior Art Validity* (key indicator of patent enforceability and value)
- *Technology Advancement* (general gauge on productivity of R&D investment)
- *Competitive Position* (general overview of the competitive of patent ownership within a technology sphere)

The criteria used by each corporation to evaluate its patent assets will be different. Management may have completely different objectives each time it polls the portfolio (e.g: SOX reporting, audit the long term effectiveness of R&D investment, cluster patents for technology no longer practiced, and so forth).

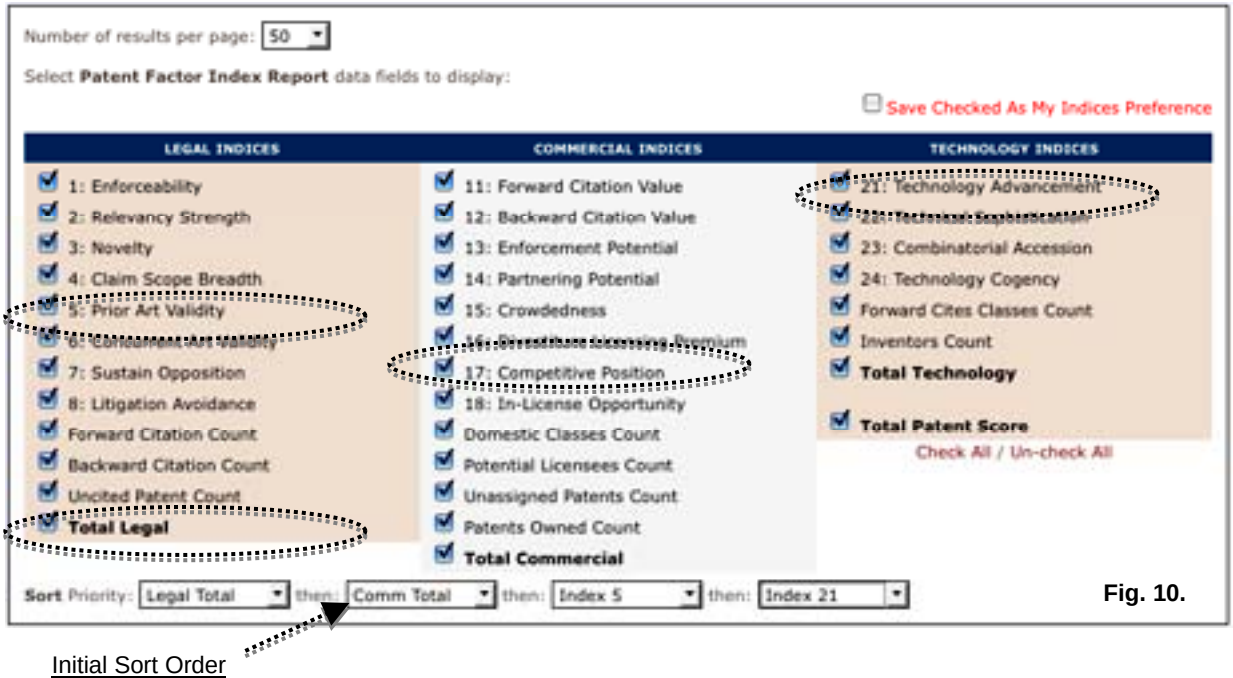


Fig. 10.

Initial Sort Order

After extracting the data in CSV format (Excel® spreadsheet), we'll look for any other key indices that correlate consistently to the highest quality patents.

Portfolio: 5,790 patents (mid-sized) owned by a Fortune 500 company supplying automotive components and assemblies.

The following Figs. 11. – 13.graphically present the portfolio breakdown by three key indices: *Legal Quality, Commercial Quality, and Technology Advancement*. By overlaying commercial and legal quality, we identified those patents that likely represent the core assets of the company.

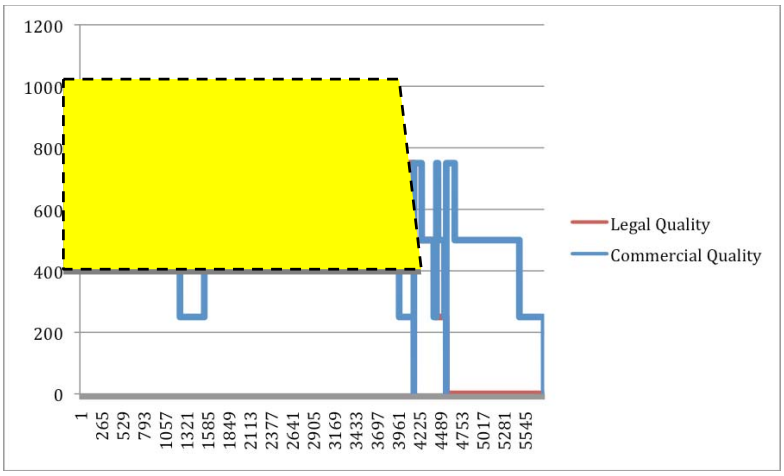
Each of these chards can be drilled down to the individual patent level.

The number of questions that can be asked of the portfolio data, and the amount of high-resolution information that can be extracted, is virtually unlimited.

The portfolio is presented only as a *Total Legal Score* analysis. The large percentage of the portfolio with a Legal Score less than 500 may identify patents that should be evaluated for selling / cost reduction.

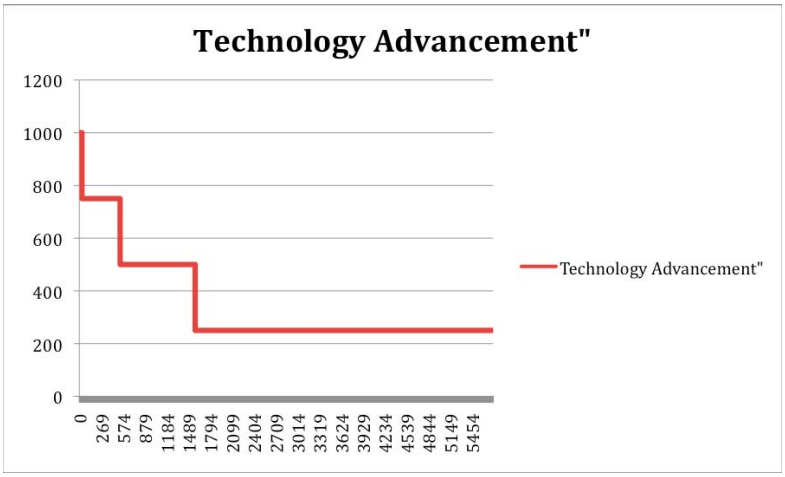
Legal Score	No. Patents	% of portfolio
1000	1551	27%
750	2612	45%
500	280	5%
250	126	2%
0	1221	21%

Fig. 11.



This graph shows the overlay of *Total Commercial Score* compared to the respective *Legal Score* for each patent. It's interesting to see a rapid drop off of commercial scores within each legal score band. The dotted line identifies those high-quality patents with high legal AND commercial qualities.

Fig. 12.



Analysis of *Technology Advancement* shows very little "leapfrog" technology. Most of the technology appears to be incremental advancement over the prior art. Since this company is in a mature automotive industry (mechanical parts), large, long term investment in leapfrog technologies may not produce the required ROI.

Fig. 13.

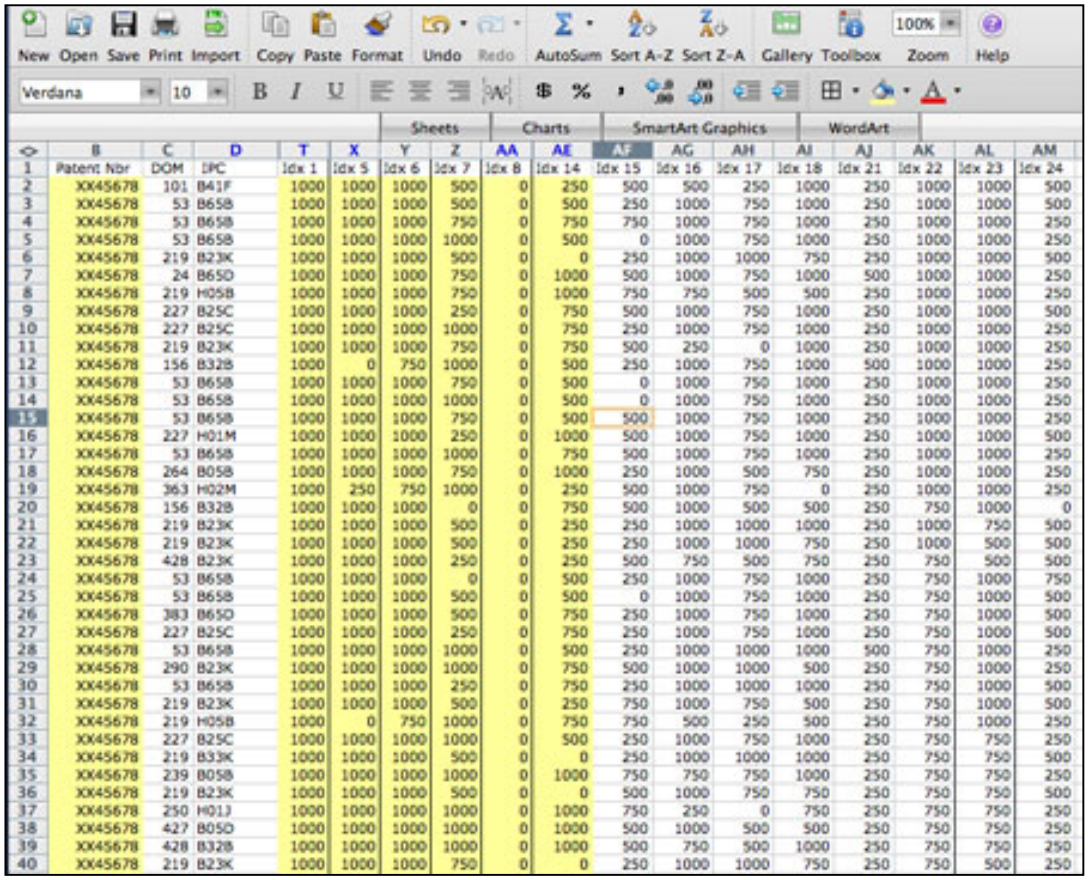
Scenario 3: IP Objective – Increase licensing revenue with high potential patents

Decision Support Question: The company wants to increase licensing revenue from its portfolio. "Hand methods" of sorting through 5,000 patents have been expensive, time consuming, and largely ineffective in rapidly identifying high opportunity patents. Can a statistical process be applied to the initial analysis, performing the "heavy lifting" of total portfolio review, setting the stage for the later hand-work of matching patents with licensee prospects?

IP Management's criteria for defining what s/he believes will identify the highest revenue licensing opportunities: :

- *Enforceability* Idx-1 (if it can't be enforced, it can't be licensed)
- *Validity Confidence* Idx-5 (statistically score probability of un-cited prior art)
- *Validity Confidence* Idx-6 (statistically score probability of un-cited concurrent art)
- *Sustainability in Opposition* Idx-7 (additional score of the legal strength prior to enforcement / assertion)
- *Partnering Licensing Potential* Idx-14 (score patent for non-obvious carrot-licensing opportunities)

The extracted results are shown and shaded yellow in the sorted Excel sheet (Fig. 14.). Column T, X, Y and AA and AE show the PFI Scores sorted in the order listed above.



Patent Nbr	DOM	IPC	Idx 1	Idx 5	Idx 6	Idx 7	Idx 8	Idx 14	Idx 15	Idx 16	Idx 17	Idx 18	Idx 21	Idx 22	Idx 23	Idx 24
XX45678	101	B41F	1000	1000	1000	500	0	250	500	500	250	1000	250	1000	1000	500
XX45678	53	B65B	1000	1000	1000	500	0	500	250	1000	750	1000	250	1000	1000	500
XX45678	53	B65B	1000	1000	1000	750	0	750	750	1000	750	1000	250	1000	1000	250
XX45678	53	B65B	1000	1000	1000	1000	0	500	0	1000	750	1000	250	1000	1000	250
XX45678	219	B23K	1000	1000	1000	500	0	0	250	1000	1000	750	250	1000	1000	500
XX45678	24	B65D	1000	1000	1000	750	0	1000	500	1000	750	1000	500	1000	1000	250
XX45678	219	H05B	1000	1000	1000	750	0	1000	750	750	500	500	250	1000	1000	250
XX45678	227	B25C	1000	1000	1000	250	0	750	500	1000	750	1000	250	1000	1000	500
XX45678	227	B25C	1000	1000	1000	1000	0	750	250	1000	750	1000	250	1000	1000	250
XX45678	219	B23K	1000	1000	1000	750	0	750	500	250	0	1000	250	1000	1000	250
XX45678	156	B32B	1000	0	750	1000	0	500	250	1000	750	1000	500	1000	1000	250
XX45678	53	B65B	1000	1000	1000	750	0	500	0	1000	750	1000	250	1000	1000	250
XX45678	53	B65B	1000	1000	1000	1000	0	500	0	1000	750	1000	250	1000	1000	250
XX45678	53	B65B	1000	1000	1000	750	0	500	500	1000	750	1000	250	1000	1000	250
XX45678	227	H01M	1000	1000	1000	250	0	1000	500	1000	750	1000	250	1000	1000	500
XX45678	53	B65B	1000	1000	1000	1000	0	750	500	1000	750	1000	250	1000	1000	250
XX45678	264	B05B	1000	1000	1000	750	0	1000	250	1000	500	750	250	1000	1000	250
XX45678	363	H02M	1000	250	750	1000	0	250	500	1000	750	0	250	1000	1000	250
XX45678	156	B32B	1000	1000	1000	0	0	750	500	1000	500	500	250	750	1000	0
XX45678	219	B23K	1000	1000	1000	500	0	250	250	1000	1000	1000	250	1000	750	500
XX45678	219	B23K	1000	1000	1000	500	0	250	250	1000	1000	750	250	1000	500	500
XX45678	428	B23K	1000	1000	1000	250	0	250	500	750	500	750	250	750	500	500
XX45678	53	B65B	1000	1000	1000	0	0	500	250	1000	750	1000	250	750	1000	750
XX45678	53	B65B	1000	1000	1000	500	0	500	0	1000	750	1000	250	750	1000	500
XX45678	383	B65D	1000	1000	1000	500	0	750	250	1000	750	1000	250	750	1000	500
XX45678	227	B25C	1000	1000	1000	250	0	750	250	1000	750	1000	250	750	1000	500
XX45678	53	B65B	1000	1000	1000	1000	0	500	250	1000	1000	1000	500	750	1000	250
XX45678	290	B23K	1000	1000	1000	1000	0	750	500	1000	1000	500	250	750	1000	250
XX45678	53	B65B	1000	1000	1000	250	0	750	250	1000	1000	1000	250	750	1000	500
XX45678	219	B23K	1000	1000	1000	500	0	250	750	1000	750	500	250	750	1000	500
XX45678	219	H05B	1000	0	750	1000	0	750	750	500	250	500	250	750	1000	250
XX45678	227	B25C	1000	1000	1000	1000	0	500	250	1000	750	1000	250	750	750	250
XX45678	219	B33K	1000	1000	1000	500	0	0	250	1000	1000	1000	250	750	750	500
XX45678	239	B05B	1000	1000	1000	1000	0	1000	750	750	750	1000	250	750	750	250
XX45678	219	B23K	1000	1000	1000	500	0	0	500	1000	750	750	250	750	750	500
XX45678	250	H01J	1000	1000	1000	1000	0	1000	750	250	0	750	250	750	750	250
XX45678	427	B05D	1000	1000	1000	1000	0	1000	500	1000	500	500	250	750	750	250
XX45678	428	B32B	1000	1000	1000	1000	0	1000	500	750	500	1000	250	750	750	250
XX45678	219	B23K	1000	1000	1000	750	0	0	250	1000	1000	750	250	750	500	250

Fig. 14.

Although the patent numbers on this actual analysis are intentionally obscured, it's easy to quickly identify the patents with a statistical likelihood of producing the highest licensing revenue, based on the criteria analyzed. It's interesting to note that the patents span a very broad range of US and International Patent Classifications. A subsequent sort on classifications would allow the licensor to approach the licensees with groups of related patents, increasing the potential value of each opportunity.

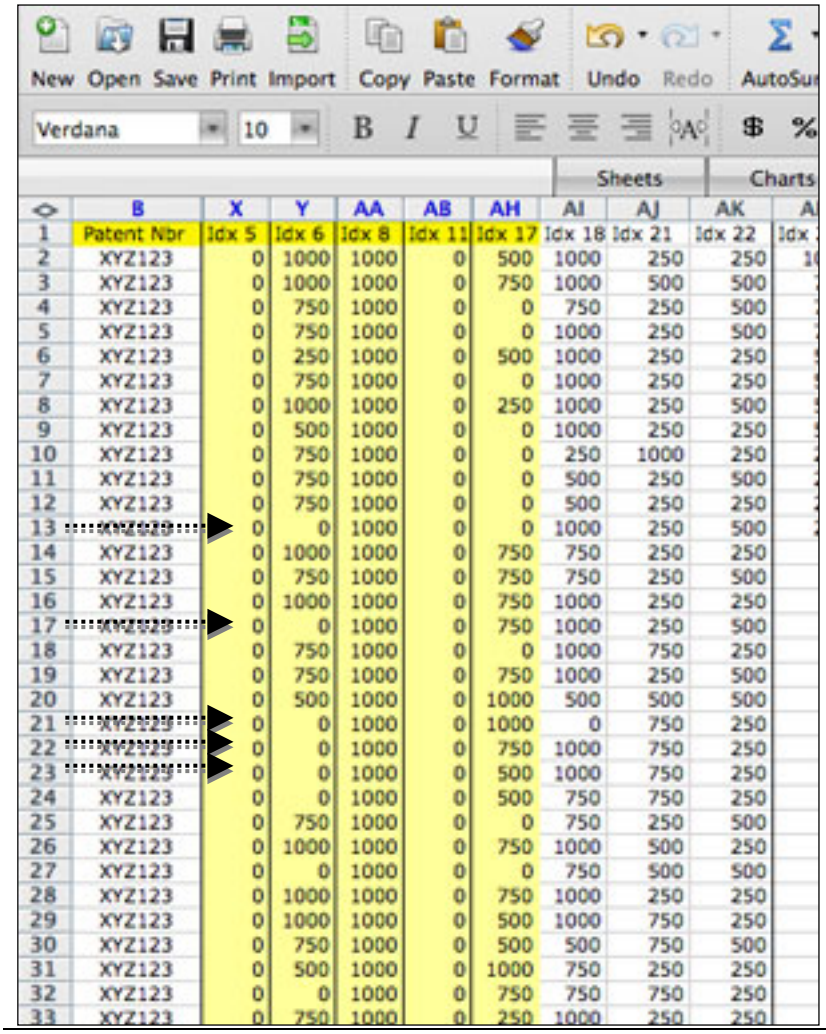
Scenario 4: IP Objective – Reduce costs by pruning low quality patents from a large portfolio

Decision Support Question: Management wants to reduce patent maintenance costs by culling unwanted patents from a portfolio. Combined, the 7.5 and 11.5 year US patent maintenance fees are $6,000 / patent. Pruning 500 patents from a large portfolio would save for $3,000,000 that can be re-purposed. Can a pruning process be quickly conducted – and repeated annually on patents coming up for a periodic fee payment without unreasonable outside consulting costs?

IP Management's criteria for identifying lowest quality / lowest potential value patents to prune from the portfolio:

- *Validity Confidence* Idx-5 (statistically score probability of un-cited prior art)
- *Validity Confidence* Idx-6 (statistically score probability of un-cited concurrent art)
- *Litigation Avoidance* Idx-8 (identify patents most likely to be contested)
- *Forward Citation Value Contribution* Idx-11 (ascending, find patents that have not earned forward citations)
- *Patent Group Competitive Position* Idx-17 (sort ascending to identify "orphan" patents)

Using Portfolio-Xpert's Patent Factor Index scoring system to compute large portfolio data sets, we quickly identified those patents that contain no forward citations (Col. AB), as well as those scoring ZERO in Validity Confidence (Col. X).



	B	X	Y	AA	AB	AH	AI	AJ	AK	A
1	Patent Nbr	Idx 5	Idx 6	Idx 8	Idx 11	Idx 17	Idx 18	Idx 21	Idx 22	Idx
2	XYZ123	0	1000	1000	0	500	1000	250	250	1
3	XYZ123	0	1000	1000	0	750	1000	500	500	
4	XYZ123	0	750	1000	0	0	750	250	500	
5	XYZ123	0	750	1000	0	0	1000	250	500	
6	XYZ123	0	250	1000	0	500	1000	250	250	
7	XYZ123	0	750	1000	0	0	1000	250	250	
8	XYZ123	0	1000	1000	0	250	1000	250	500	
9	XYZ123	0	500	1000	0	0	1000	250	250	
10	XYZ123	0	750	1000	0	0	250	1000	250	
11	XYZ123	0	750	1000	0	0	500	250	500	
12	XYZ123	0	750	1000	0	0	500	250	250	
13	[illegible]	0	0	1000	0	0	1000	250	500	
14	XYZ123	0	1000	1000	0	750	750	250	250	
15	XYZ123	0	750	1000	0	750	750	250	500	
16	XYZ123	0	1000	1000	0	750	1000	250	250	
17	[illegible]	0	0	1000	0	750	1000	250	500	
18	XYZ123	0	750	1000	0	0	1000	750	250	
19	XYZ123	0	750	1000	0	750	1000	250	500	
20	XYZ123	0	500	1000	0	1000	500	500	500	
21	[illegible]	0	0	1000	0	1000	0	750	250	
22	[illegible]	0	0	1000	0	750	1000	750	250	
23	[illegible]	0	0	1000	0	500	1000	750	250	
24	XYZ123	0	0	1000	0	500	750	750	250	
25	XYZ123	0	750	1000	0	0	750	250	500	
26	XYZ123	0	1000	1000	0	750	1000	500	250	
27	XYZ123	0	0	1000	0	0	750	500	500	
28	XYZ123	0	1000	1000	0	750	1000	250	250	
29	XYZ123	0	1000	1000	0	500	1000	750	250	
30	XYZ123	0	750	1000	0	500	500	750	500	
31	XYZ123	0	500	1000	0	1000	750	250	250	
32	XYZ123	0	0	1000	0	750	750	750	250	
33	XYZ123	0	750	1000	0	250	1000	250	250	

Fig. 15.

Additional indices were also reviewed in this analysis to investigate whether additional correlations exist between the intended and the non-obvious indices, identifying any additional value indicators (Fig. 15.).

Together with sorting on other indices, the patents with the lowest qualitative scores are instantly sorted to the top of the list of almost 6,000 patents. Legal or subject matter experts are now required to evaluate these patents on an individual basis.

The typical process of pruning undesirable patents from a portfolio of 5,000, 10,000 or more patents can consume months of effort. By applying a computer analysis of parameters similar to what an IP manager would typically use in deciding what patent to divest or abandon, a multi-month patent identification process can be reduced to

hours or days.

Scenario 5: IP Objective – Comparing Portfolio Quality and Market Capitalization

Decision Support Question: Whether for competitive intelligence or to support a SOX report on a patent estate, qualitative analysis of multiple portfolios of companies serving the same markets with the same technology and products will provide interesting information. Will the analysis of the "best / worst technology performers" in a given market shape the patent estate quality model?

IP Management's criteria: Objectively evaluate the overall quality of the company's patent portfolio, and that of its key competitor.

- *Average Total Patent Score*
- *Average Total Legal Score*
- *Average Total Commercial Score*
- *Average Total Technology Score*

To develop the scores for 20 quality indices for the nearly 6,000 patents in each portfolio, more than 11,500,000 data points were computed (22 million data points total for 2 portfolios). Computing the portfolio scores for these large estates required 150 hours for each portfolio. The quantity of data is significant, and as can be seen from the small spreadsheet clip in Fig. 16, provides unlimited analyses on any one or more indices as management elects.

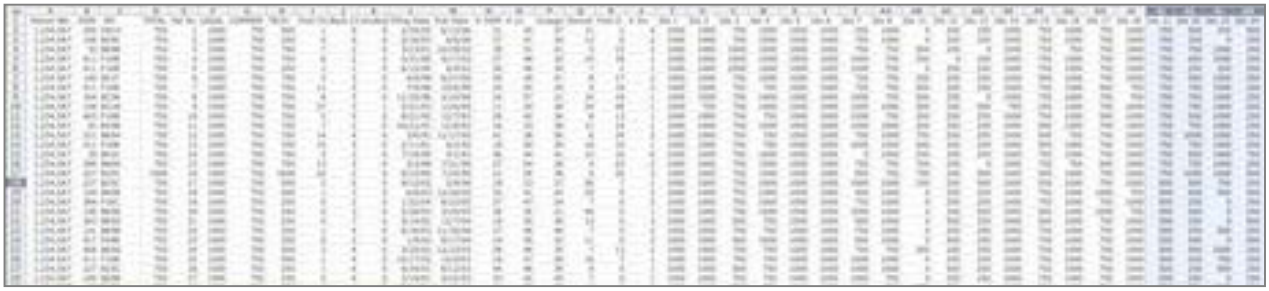


Fig. 16.

By taking the total scores averages, and breaking them into 100 point quality bands, the number of patents that each company owns within each band were determined. The bar chart (Fig. 17), shows how the nearly 6,000 patents of both companies differ.

Although the data is high level, it does clearly illustrate that the company with a market cap nearly three times the competitor's has a disproportionately higher number of patents in the 600 and 700 quality bands. Company "B" with the lower market cap shows more than 50% of its patents as very low quality.

This analysis will not show whether the significant difference in market caps are the cause, or effect of the differences in portfolio quality, causality was not within the scope of this analysis. However, this approach to competitive portfolio comparison and market cap references has been consistent in showing a positive correlation between higher quality portfolios, and the higher market cap of companies in many industry segments that compete in a similar market space.

At this point, management of either company can immediately develop strategic plans to cull poor quality patents, and begin a portfolio-building campaign to increase portfolio value through acquisition – and in the longer term, through strategic asset development.

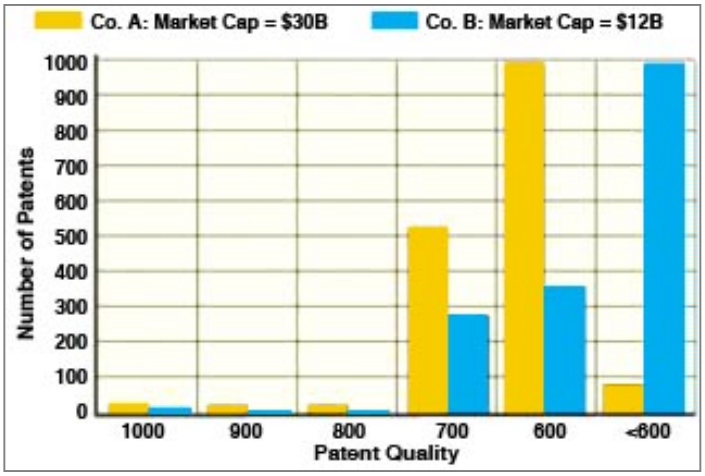


Fig. 16.

From this high level, the flexibility of patent portfolio management via qualitative patent scores will allow the IP managers to quickly drill back into the individual patent scores.

Upon identifying clearly differentiating scores on any of the indices, the IP manager can implement a portfolio management process to improve quality, increase revenue, cut costs, and increase its competitive position.

The first 4 scenarios in this section are not unlike some of the objectives-driven portfolio management initiatives that could emerge out of the higher level portfolio analysis process.

Other elements of portfolio management may begin to play into the overall mission, such as the initiation of a aggressive licensing campaign (if one does no already exist), or the immediate pruning of poor quality patents (to generate revenue from the sale of patents, save money, and raise total portfolio quality average).

Because this bird's-eye view of the portfolio is built using bottom-up computed data points for each patent, drilling back down into the patents on which action should be taken is highly efficient, and precise. The bottom-up analysis allows IP managers to **manage-by-the-numbers**.

Conclusion

Intangible assets comprise more than 85% of the market cap of the S&P 500 companies, and are exceedingly important to high technology organizations that rely on innovation superiority to capture and maintain market share.

Patents, a core component of these intangible assets, must be managed just as diligently as tangible assets. Without some tangible information however, effective management is nearly impossible, or at the very least, grossly inefficient.

Patent Factor Index Reports provide IP managers with a highly reliable set of data points by which to assess key quality indicators for every patent, Within the framework of the Portfolio-Xpert IP management software, IP managers can now effectively identify high and low quality assets, and using objective data, can begin to apply traditional "manage-by-the-numbers" techniques to the intellectual property management process.

Related white papers:

Gibbs, A; *Explanation of PatentCafe® Patent Factor Index™ Reports (PFI); The Practical Application of Statistical Quality Scoring to Effective Patent Management,* 2008

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

Data and Software Tools References

Software: PatentCafe® Portfolio-Xpert™ portfolio analysis solution

Data and Information Source: PatentCafe® international patent data collections, other references as cited.

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