



Valuation of Patent

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The introduction of intellectual property rights in a knowledge-based economy brought the requirement of the valuation of intellectual property rights, including patents, trademarks, rights acquired, etc. This article presents an introduction to the qualitative & quantitative evaluation approach for intellectual property. The scientific indicators for the valuation of patents are also discussed.

Keywords: Intellectual Property Rights, Scientific-Indicator, Patents, ICT organizations, IP assets, book value, Qualitative Valuation, Current Impact Factor, Technology Life Cycle

From the industrial revolution to the eighties, the market value was defined by the assets owned by the organization; thus the management's policies were more inclined towards increasing 'brick and mortar industries', i.e., land, labor, capital and infrastructure. However, with the introduction to uniform intellectual property rights and rapid development in ICT industries, the early nineties saw the dawn of intellectual property rights, where organizations strived for IPR as an asset to own. With the advancement in science and technology, the share of intellectual property for an ICT organization was sometimes twice the book value. In the studies conducted by Standard & Poor 500 market value, it was observed that more than 70% of the market value of public companies was due to its IP assets. The 10-year performance of the companies, as analyzed by Ocean Tomo 300, Patent Index revealed that companies with IP assets performed better the companies without IP assets. Citing the importance of IP for a business, many large organizations such as TATA, Mahindra & Mahindra, Aditya Birla Group and government organizations such as ISRO, DRDO have realized that the management of IP assets can no longer be considered as a discretionary function of the legal department and have a dedicated team of techno-legal experts working in their dedicated IP departments.¹

An organization's worth, also called market values, can broadly divide into two parts, i.e., book value and IP value.

Market Value = Book Value + IP Assets

Book Value is similar to 'brick and mortar industries,' i.e., land, labour, capital & infrastructure and IP assets comprise the value of all intellectual property right owned, i.e., Patents, Copyrights, Trademarks, Geographical Indicators, Industrial Designs and rights acquired by agreements such as, Licenses, Patent Pools, etc. If one looks at the balance sheet of IC companies like Microsoft, it is observed that the market value surpasses the book value by over 10 times. However, if large companies like General Electric or similar conglomerate, their book value represents only 10% of market value. The same is also true for ICT companies like Google, Netflix, Amazon, Apple, etc. This significant gap in the market value and book value represents the human capital, intellectual property, structural capital and other forms of knowledge that the companies have exploited to generate cash flow. Since IP assets have been contributing over 80% of the market value of a public company, the valuation of IP assets is now the top priority of knowledge-driven organizations.² This article has discussed the theoretical approach to valuation, i.e., qualitative and quantitative valuation approaches for patents followed by scientific-based indicators for patent valuation for ICT industries.

Valuation of Patents

While evaluating a patent, one must define a relation between legal and economic aspects, including the life cycle of technology, market potential, licensing potential, and competitor's technology (Fig. 1).

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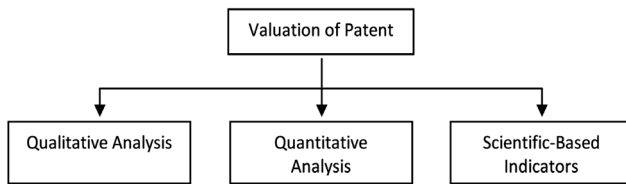


Fig. 1 — Valuation of Patents

Qualitative Valuation Approach for Patent

The qualitative approach of patent valuation is based on rating and scores for different patent indicators. These indicators can increase or decrease the patent's values. In some cases, the indicators are derived from Internationally Agreed Numbers for the Identification of (bibliographic) Data.¹

One of the examples of Qualitative Valuation is IPScore, software developed by Danish Patent and Trademark Office in 2001, for internal use by organizations.³ The software has approximately 40 indicators distributed under legal, technology, market, finance, and strategy categories. Each indicator is rated 1 to 5, representing the strengths and weaknesses of patent.⁴ Once all indicators are rated, the output is presented in the form of tables and graphs, providing risks and opportunities available for making strategic decisions.^{5,6} The primary advantages of qualitative valuation are its usefulness for identifying IP asset strengths and weaknesses, availability of valuable insights for strategic decisions, monitoring of IP assets.

Quantitative Valuation Approach for Patent

The quantitative approach of patent valuation is based on analytical data involving various calculations. This can be conducted in three ways:

Cost-based Valuation of Patent

The cost-based method for valuation of a patent is based upon the economics of acquiring the patented technology, either through internal sources such as in-house research and development for replacement or substitute or through external sources such as licensing or patent pools. This method is generally applicable to recently developed or non-commercial technologies for which development cost is available; hence cannot be used to non-patented or non-disclosed technology. This method relies on historical data available on the patented technology, including investments in research and development of technology, cost of acquisitions involved such as licensing part of patented technology, deductions due to depreciation or obsolescence of technology, availability of alternative technologies,

return in investment, etc.^{7, 8, 9} The cost of new patent using cost-based method for valuation of patent can be calculated as:

$$\begin{aligned} \text{Cost of new patent} \\ &= (\text{Direct cost} + \text{Indirect cost} + \text{ROI}) \\ &\quad - \text{Depreciation} \end{aligned}$$

Income-based Valuation of Patent

The income-based method for valuation of a patent is based upon microeconomic data of patent. This is advantageous in case both licensee and licensor. The licensee can use this approach to determine income resulting from the rights acquired for the economic exploration for the license duration, whereas the licensor can further add royalty to the income earned.⁸ The economic exploration of a patent by a commercial entity generally involves microeconomic data of patented technology such as gross sales, net income, revenue from licensing, etc. Other variables to consider include: State of the Art Search or Landscape Search to determine the scope of market^{10, 11} and Freedom to Operate Search to determine the scope of claims of patent.¹² The income-based method for valuation of the patent provides precise valuation however, it is costly and often prohibitive for the purpose of valuation, capital allocation, taxes and licensing.

Market-based Valuation of Patent

The income-based method for the valuation of the patent is based upon the comparison of similar patents' transactions in the market (Patents' value or royalty). However, due to lack of transparency, this approach is significantly less reliable and rarely used.⁹ By comparing market rates, this approach can provide a real-time valuation of patents by analyzing similar patent transactions. Here, the costs of similar patented technologies are compared, especially the most recent ones, to determine the current market price of the technology. However, due to lack of transparency and licensing being considered as trade secret by the organizations, it is difficult to determine accurate estimation.^{8, 9, 13}

According to Parr and Smith,¹⁴ valuation of patent by comparing market rates may not present the best value of IPR; thus, value derived from them will be suboptimal. Another approach is comparing royalty in the market. An average royalty is calculated by conducting a market survey to determine average royalty rates of similar patented technology to establish royalty rates for licensing or filing damage charges in litigation.^{8, 15} The market-based is a straight

forward approach to use to check the validity of other approaches.

Scientific-Indicator based Valuation Approach for Patent

The qualitative and quantitative-based approaches for the valuation of patents are mostly developed by academics and economists, and due to subjective in nature, do not produce accurate results. Since 2000s, few econometric approaches have also been considered, such as, Hirchey and Richardson,¹⁶ MIT,¹⁷ etc., which resulted in introducing a scientific-indicator-based approach to patent’s valuation. These indicators are useful for determining valuation of bundle of patents and hence are useful for assessments of patent pools, mergers and acquisitions, bundled rights, etc. Out of these, the prominent indicators are Current Impact Factor,^{17, 20, 21} Technological Strength,^{17, 21} Science Linkage,^{16, 17, 21} and Technology Life Cycle.^{16, 17, 18, 21}

Current Impact Factor or CII provides a measure of how significant organizations patents are for the current development in the field. The indicators are based on how frequently the organization's patent have been used as ‘prior art’ in the last five years.

Technological Strength or TS provides a measure of the strength of an organization's patent pool. It gives an estimate of an organization's investment in research and development and its output in form of commercially viable and patented technology. The product of organizations’ CII with the number of

patents filed in last five years represents the technological strength.

$$TS = CII \times Patents\ filed\ in\ last\ 5\ years$$

Science Linkage or SL provides an idea of the relevancy of patented technology in current research. If the science linkage is high, that means the technology is still being explored and if science linkage is low, that means the technology has been explored enough to begin its commercial exploration. In short, the higher the number of ‘other references’ per patent, higher are the opportunities available for scientific exploration.

$$SL = \frac{Other\ references}{Total\ number\ of\ references}$$

Technology Life Cycle or TLC, is a measure of the age of technology by calculating the median of patents filled each year with similar nature. It is assumed that the more recent the age the more quickly one generation of invention is being replaced with another. The best approach for calculating TLC by analyzing the application graph filled v/s year of filling. As shown in Fig. 2, the patent filling trend rises exponentially, representing its growth as new technology to growing technology and finally becoming key technology. The key technology is the base technology for further commercial exploration; hence the curve becomes saturated at this point. If the

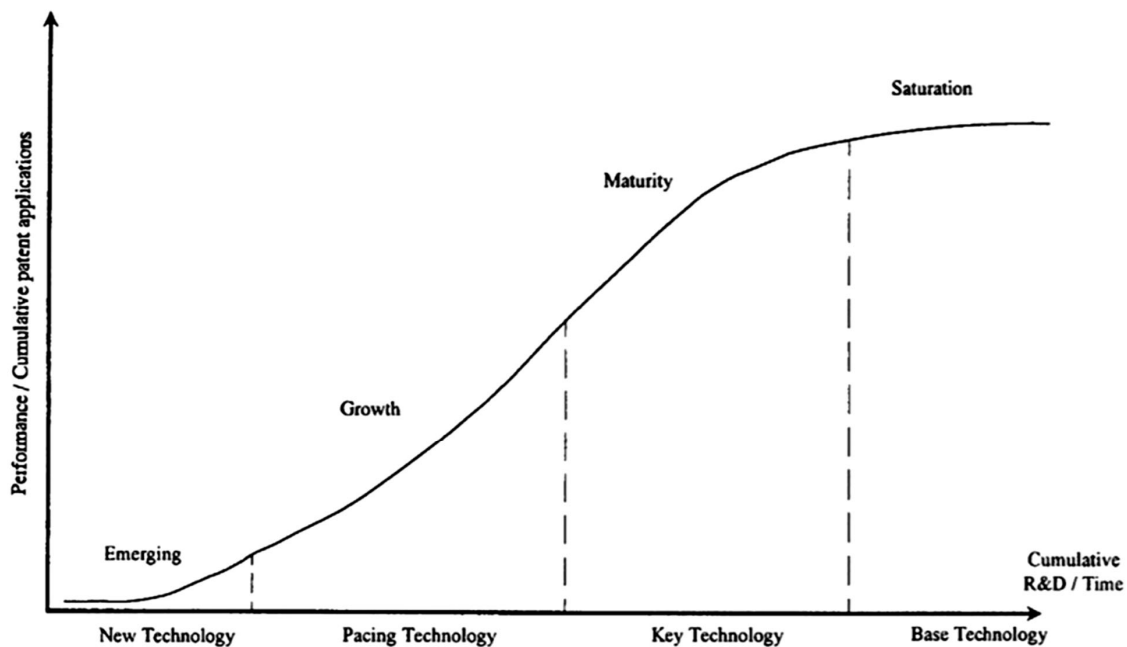


Fig. 2 — The S-curve concept of technology life cycle²¹

saturation sustains, the technology becomes base technology (eg. LED for display in 2020) and if the saturation declines, then the technology becomes obsolete technology (eg. CRT for display in 2020).

Conclusion

This article has explored the qualitative & quantitative approaches to patent valuation along with the latest trend of the scientific-indicators based approach. The qualitative and quantitative based approaches for valuation of patents are mostly developed by academics and economists do not produce accurate results. The major drawbacks of the quantitative approaches discussed above includes different interpretation of indicators by different entities, which may result in a varying valuation of same IP asset by different entities while using cost-based approach; The lack of defined correlation between investment & future earning and microeconomic data such as the relationship between patents, production cost, earning information, licensing, royalty rates, etc, the results from income-based approach may encourage unnecessary overspending and lack of relevant information such as investment in case non-patented technology or unique technology, market-based approaches are challenging to analyze.

Combining the statistical tools with economic theories, the scientific-indicators-based approach has successfully determined the patent's value especially for cases of mergers and acquisitions, bundled rights, etc. The method provides excellent results for monitoring patent pool or organization portfolio while removing the biggest challenge in subjective approaches, i.e., the difference in interpretation by different entities. Further, development in econometric methods based approaches are expected to provide better equations for patents valuation.

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