

# Key Intellectual Property Issues In Nanotechnology

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## Abstract

Great attention has been paid in recent years to the importance of intellectual property to successful R&D and commercialization of technology. The issues raised have included the appropriate role and expense of IP in the R&D and commercialization environments, the impact of intellectual property on companies' freedom to use technology in new products and the role of intellectual property in extracting maximum value from R&D by providing alternative commercialization paths including licensing, business spin offs, joint ventures and packaging the innovative business for sale to another party. Nowhere has this interest been keener than in the rapidly expanding and commercially unpredictable area of nano-materials. This paper will provide a basic understanding of the key intellectual property issues most important to nano-materials, including practical advice for managers and R&D personnel on efficiently creating intellectual property processes and policies appropriate to companies in the nano-materials business.

## Introduction

In the August 2006 issue of the *Scientific American*, p. 39, Mihail C. Roco, senior adviser for nanotechnology at NSF and an architect of the National Nanotechnology Initiative, proclaimed "over the next two decades, [nanotechnology] will rise to prominence through four evolutionary stages...."[1] He predicted a \$1 trillion contribution to the global economy from nanotechnology as early as 2015. Science has explored the world going out, to space, and going in - digging into matter at ever finer levels of detail. In the 1990's, broad-based recognition spread that there were important scientific discoveries to be made and commercialized in the nanospace. These advances have and will require massive investment. The foremost way to protect and optimize that investment is intellectual property.

Intellectual property presents new challenges wherever it collides with new technology. Fortunately, the U.S. patent system has responded fairly well to the nano-technology challenge and the associated torrent of nano patent filings.

Still, with all the patent filings, many issues become large. Interference issues arise more frequently. Licensing can involve splitting up fields of use and accommodating issues of stacking royalties. Many government related patent and technology transfer issues including Bayh-Dole issues pop-up. Can startups set up university pipeline licensing arrangements? How onerous are the domestic manufacturing requirements?

Not every one of these issues and questions can be answered in this short article, but we hope to provide some useful background.

## What Is Intellectual Property?

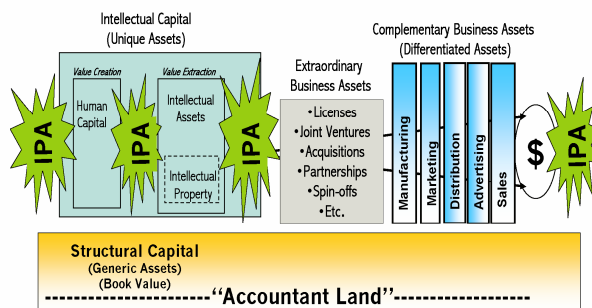
Fundamentally, it is two things.

1. The legally protectible creativity of humans – in several "flavors": patents, trade secrets, know-how, etc.
2. A set of tools that help a company manage and create value from its human creativity.

## IP's Role In A Business

The following illustration may help explain the role of Intellectual Property in a business.

Figure 1



J. 'Shaughnessy, Rockwell, Int., Adapted by Russ Barron, Foley & Lardner LLP

Intellectual Property Activity (IPA) impacts at many management points. The IPA "starbursts" in the illustration above reflect those points at which IP can affect a business.

"Structural capital" are the bricks, mortar, machinery and other (usually) commodity assets of a business. These are often included by business people in the "Book Value" of a company. Typically, in American companies, the total value of the company ("Market Capitalization") far exceeds the Book Value by a multiple of 2-10. Intellectual Capital (including IP) is a major component of value (premium) above book value. It represents the future pipeline of new (and, perhaps, exclusive) products and services that inspire the public to buy the business's stock in mature companies and to invest in new companies.

Figure 2



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Well-managed intellectual property can greatly increase the value of a company. Let's look at how IP can affect company performance. To do so we need to keep in mind that IP management demands a unique set of skills and communication channels. It is the coordinated work ("IP Best Practices") of three diverse disciplines – Business, Technology and Law. [Figure 2.]

The first IPA starburst [Figure 1] reflects the creation of corporate policies regarding the development of IP, and the setting of company goals and the communication of those goals to the employees. Solid leadership in IP management can inspire innovation, and should support training and reward programs that lead to the development of intellectual assets.

The second IPA starburst reflects the harvesting of the IP, and the designing of the IP portfolio. Harvesting is efficiently extracting the innovations that will best serve the company's goals. It requires intimate knowledge of the business's people and the business's directions. Designing the IP portfolio requires a knowledge of the goals of the company, and a plan for taking the company forward.

The third IPA starburst reflects the application of the Intellectual Property to the Complementary Business Assets such as manufacturing and marketing. The third IPA starburst also applies to licensing IP assets, joint venture formation, and the generation of potential business spin-offs. (Extraordinary Business Assets).

The fourth IPA starburst represents the way that the company projects itself to the world in terms of its IP. Metrics can be provided for an annual report to show the strength and growth of an IP portfolio. Metrics can also show increased revenue and increased market capitalization based on solid IP management. In short, a sound IP program can make a nanotechnology company more valuable.

While IP was formerly viewed primarily as a means of protecting the corporation's product revenue streams, it is now increasingly viewed as a source of revenue and profit generation as well as collateral for the attraction of working capital. Nowhere is this more true than in the rapidly evolving area of nanotechnology. IP programs have become both more visible and more instrumental as indicators of technical prowess and fiscal stability that are fundamental to perceptions of overall competitiveness. These can be key to investment success for nano companies. Being able to assess the value of IP programs is necessary to enable the corporation to make its investment trade-off decisions and to measure the success of those decisions as well as convincing potential investors of the value of the company's technology.

IP management should shift management tools from the generally ineffective cost approach seen most often to a value approach that looks at the real contribution made by IP to the company – good or bad. Sound IP management, especially licensing revenue and market exclusivity, are good advertisements for the shares of the company. Additionally, if a company can measure the effectiveness of its own IP effort, it can measure someone else's, such as a competitor or potential M&A partner.

### **Types Of IP Metrics**

IP metrics can be categorized into the following four areas:

Technology Development Metrics measure the propriety and effectiveness of the company's technology development.

Examples include the number of patents a company generates a year or the portion of revenue invested in research and development.

Risk Management Metrics measure the ability of a company to minimize its exposure to threats on its IP as well as avoiding infringing on another company's IP. Risk Management Metrics include the cost of IP litigation per case, internal opportunity costs, total potential litigation exposure and the value of litigation avoided by successful product clearance programs.

Revenue Driver Metrics measure a company's success and ability to generate revenue by product from its IP program. These metrics include patent utilization ratios, licensing out revenues, and joint venture success.

Efficiency Metrics measure a company's ability to make use of available technologies and IP services. These metrics may consider the cost of developing technologies internally as well as costs of purchasing or licensing in available market technologies.

### **Nanotechnology Companies**

In many companies, only two IP metrics are tracked: 1) the number of patents held, and 2) the amount of revenue generated by IP, usually from out licensing.

An improved metric is the way the IP covers the products and technology of the company. Understanding which patents relate to the products of the company permits a company to determine whether the patent program has been effective in its protection of the key products of the company and whether to retain or abandon some of its patents.

Valuing market share protection is also an important metric to use in valuing the IP management function in a nanotechnology company. Changes in market share caused by the introduction of patented features is a related, important metric. Additionally, the changes in market share due to the expiration of a patent can also show the success of the patent protection during its lifetime.

Nanotechnology companies can also consider the ratio of sales to patents. Another variation of this metric is the volume of sales that is patent protected. In order to be able to use this factor, however, it is necessary for the company to be able to link its patents and its products.

### **A Crucial Activity In Nanotechnology Companies**

Companies can rank their patents according to certain variables to determine how their patent portfolio is changing over time. The variables can identify factors important to that particular company and should reflect the goals and policies of the company. Once appropriate metrics have been chosen, the patent portfolios of competitors can also be ranked to benchmark the relative strengths of the portfolios. The authors and 1790 Analytics LLC have developed various methods of evaluating the strength of a patent portfolio. Some of those methods are described below.

Information about the average licensing revenue per patent is an external metric that can be used for evaluation of the licensing portfolio. Over time, such an analysis can also be used to show portfolio trends, to show whether the licensing revenue of the patent portfolio is keeping up with expected licensing revenues based on these statistical averages.

The impact of an organization's patent portfolio can be assessed by tracking how frequently its patents are cited by later

patents. Research has shown that patents cited by many later patents tend to contain important ideas upon which the later patents build.

The originality of a patent can be assessed on the breadth of the patent classes cited by the patent. Patents created by combining ideas from several different technologies are likely to be more original than patents making incremental improvements upon earlier patents in the same technology. Analogously, the generality of a patent can be determined by recognizing that patents cited by later patents from many different fields tend to have more general applications than those that are only useful within a specific field.

The power of the IP portfolio is a summary metric that measures the overall strength of an organization's patent portfolio by taking the product of all of the metrics. Many studies have shown that measures combining both quality metrics and patent counts are much better indicators of organizations' R&D quality than patent counts alone.

Metrics such as these are useful in both internal and external evaluations of an IP management program. Trends can be noted, goals can be set, and comparisons can be made over time for both the IP program itself, and the programs of competitors. The metrics can be applied to entire patent portfolios, or to subsets representing particular technologies of interest. For example, companies can use these metrics to identify highly influential, or highly original, patenting organizations within a particular technology.

## Types Of Intellectual Property

1. Patents
2. Trade Secrets and Know-How
3. Trademarks and Service Marks
4. Copyrights and Mask Works

## What Is A Patent?

U.S. Patent: a government grant to an inventor, giving the right to exclude others from making, using, offering to sell, or selling the patented invention for a limited time. The patented invention is defined by the claims.

## Three Kinds:

(i) Utility Patents: New and useful processes, machines, articles of manufacture, compositions of matter, and improvements thereof. (ii) Design Patents: Ornamental designs for articles of manufacture and (iii) Plant Patents: Asexually reproduced plants.

## How Is A Patent Obtained?

- Conceive a "patentable" invention
- Conduct a patentability search (optional)
- Determine novelty of invention
- Prepare a patent application
- File patent application with USPTO (and foreign countries)
- Prosecute application until patent issues
- Pay maintenance fees
- Note: "making" the invention is not required

## Requirements Of A "Patentable" Invention:

- It must be "new," never before done in every claimed detail
- Non-obvious – sufficiently different to merit patent enforcement. This is a very complex subject not addressed here

## How Can A Patent Be Exploited?

- Exclude others from making, using, selling or offering for sale
- Use as a defense
- License the patent
- Sell the patent

## Patent Portfolio Value Comes First From Claim Quality

As An Inventor Or Manager, You Should Question:

1. Any "means" claim, i.e. one that says "means for...."
2. Any claims more than 20 lines long
3. Fewer than 20 claims
4. Claims with limiting preambles or other unnecessary language
5. A specification less than 6 columns long
6. No or only one example in the text

As An Inventor Or Manager, You Should:

1. Remove every unnecessary word from the claims
2. Be sure your claims cover
  - What you do
  - What you think you'll do
  - What you think your competitors will do
  - Fields outside of your employer's business
3. Never permit your patent lawyer to make more than one amendment change at a time

## What Is A Trade Secret?

Trade Secret: a formula, pattern, device, or compilation of information used in one's business which gives one the opportunity to obtain an advantage over competitors who did not know or use it. (e.g., secret formulas, manufacturing processes, customer lists)

## What Is Know-How?

Know-How: the unpatented intangible rights a company has developed (or acquired) in its manufacturing technology and processes. (e.g., technical drawings, specialized manufacturing expertise)

## How Is A Trade Secret Obtained?

- Create (develop) "secret information"
- Maintain secrecy of information – difficult and expensive if done properly
- Use suitable employment agreements with limited time durations

## How Can A Trade Secret Be Exploited?

- Maintain secrecy (otherwise trade secret is lost)
- Confidentiality agreements
- License the trade secret
- Sell the trade secret

### **What Is A Trademark?**

Trademark: a word, name, symbol, or device used by a manufacturer or merchant to identify the source of its goods/services to distinguish them from the goods/services of others.

### **What Is A Service Mark?**

Service Mark: a trademark for services

### **Trademark/Service Mark Types:**

- Words (“Kodak”)
- Logos (McDonald's “Golden Arches”)
- Phrases (Nike's “Just do it”)
- Sounds (the NBC tones)
- Colors (Pink for Owens-Corning fiberglass insulation)
- Shapes (the Coca-Cola bottle)

### **How Is A Trademark Obtained?**

- Create (select) a “distinctive” trademark
- Conduct a trademark search
- Use the trademark in commerce (or have “intent to use”)
- Prepare a trademark application
- File trademark application (United States PTO and foreign countries)
- Prosecute application until issuance

### **Selecting A Trademark**

The Spectrum of Protectibility

1. Fanciful (made up).
  - KODAK
  - XEROX
  - CLOROX
2. Arbitrary
  - APPLE for computers
  - CAMEL for cigarettes
3. Suggestive
  - COPPERTONE for sun tan lotion
  - GOBBLE, GOBBLE for turkey meat
  - GOLLIATH for large pencils
4. Descriptive
  - TRIM for nail clippers
  - BLEND for motor oil
  - RITE-FIT for furniture slip cover
5. Generic (theory and failure to use properly)
  - ASPIRIN
  - THERMOS
  - ROLLER BLADE

### **How Can A Trademark Be Exploited?**

- Use trademark forever (if renewed)
- Trademark infringement litigation
- License the trademark
- Assign the trademark
- A trademark is ALWAYS an adjective (except for cars)

### **What Is A Copyright?**

- Copyright: the exclusive right to make and distribute copies of an original work of authorship fixed in any tangible medium of expression.
- Protects only “expression,” not “idea”

### **Copyright Covers: “Works Of Authorship”**

- Literary Works (books, writings)
- Pictorial, graphic, sculptural works (photographs, paintings, sculptures)
- Musical and dramatic works (music, lyrics, plays)
- Motion pictures and sound recordings (TV broadcasts, movies, records, tapes)
- Architectural works (building plans)
- Computer programs

### **What Is A Mask Work?**

- Mask Work: a series of related images, however fixed or encoded, representing the pattern of the surface layers of a semi-conductor chip product
- Protects semiconductor chip design masks fixed during the manufacture of the chip

### **How Is A Copyright Obtained?**

- Create (fix) an “original work of authorship”
- Copyright Notice (©1997 Tom Smith)
- File for Copyright Registration and Certificate

### **How Can A Copyright Be Exploited?**

- Copyright notice
- License the copyright
- Sell the copyright

### **Reference**

[1] Mihail C. Roco, “Nanotechnology’s Future, Scientific American, p.39, August 2006

### **Author Biography**

*Russell J. Barron, partner with Foley & Lardner LLP. He is a graduate of Princeton University (B.A., 1968) and New York University (J.D., 1974). He is admitted to practice before the U.S. Patent & Trademark Office. Russ has over 30 years experience with litigations and trials in the printing and related industries. He is a member of Foley’s Nano practice initiative.*

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