

Managing Innovation and exploring its impact on a Patent Portfolio

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Abstract

Innovation and Intellectual Property enable businesses to stay ahead in the market place. Businesses that invest in innovation around their products and processes are often faced with the challenge of managing them, so that they are able to monetize these innovations. Here, we will look at a case study to explore and understand the impact that innovation can have on Intellectual Property (IP) and patenting specifically, and how such innovation can change the product itself. Then we will look at two case studies to understand the impact innovation can have on companies – a case where innovation mattered and how it was successfully managed, and an instance where innovation management was not successful. Finally, the author discusses the lessons learnt from these case studies.

Key words: *Innovation Management; Intellectual Property strategy, Patent strategy.*

1. Introduction

Innovation has become an important facet of business in today's world. According to the definition of innovation in business terms - Innovation is the process of converting an idea or invention into a product or service that creates value or for which customers will pay; and this idea must be replicable at an economical cost and must satisfy a specific need. There are many innovation ranking forums and websites that try to simulate and forecast which company will bring out the most innovative product(s), which can change the way the world operates. While disruptive technologies are few, incremental innovations are many. Forbes ranks companies worldwide on their innovation matrix, and publishes a 'World's Most Innovative Companies' Top 100 list every year^[1]. Forbes has several parameters and algorithms to identify the most innovative companies. The key message is - innovation is now an important parameter to assess the ability of companies to function and succeed in the market place.

Innovation contributes to the growth of the business and provides a competitive edge to the products or services. However, leaders often challenge innovation at the initial stages of discussions and many ideas get lost, along with prospective business benefits. If innovations are listed on every boardroom agenda by showcasing how a structured approach towards innovation management can lead to new business models and pockets of growth, then strategies to identify value propositions can evolve in order to exploit and grow existing markets, and to explore new markets of growth^[2].

Businesses that invest in innovation around their products and processes are often faced with the challenge of managing them, so that they are able to adequately monetize these innovations. Management of the innovations also needs to ensure legal protection for the inventions that are generated during technology development and innovation processes. Even though innovation is one of the major determinants of business success, greater benefits can be reaped from innovation when the full range of intellectual property (IP) protection available to businesses is considered. Effective use of the tools of the IP system reduces risk and facilitates the process of taking innovative technology to the market place, while at the same time enhancing the competitiveness of technology-based enterprises^{[3][4]}.

WIPO has conclusively pointed out that the IP system plays a significant role in helping a business to gain and retain competitive advantage^[5]. In this paper, the author identifies innovation methodologies employed by some successful ventures. First, the author discusses the impact innovation can have on an Intellectual Property (IP) portfolio by discussing a case study which explores and tries to understand this impact on a patent portfolio, and how such innovation can change the product itself. Following this study, the author explores the various facets of innovation by studying two case studies in order to

understand the impact innovation can have on the product lines offered by companies –a case study where innovation mattered and how they were able to manage it, and one instance where innovation management was not successful, and the company suffered losses both in terms of financials as well as manpower. Finally, the author discusses the implications that these case studies can have for managers in a company and discusses how this work can be taken further to benefit businesses.

2. Literature Review

The author conducted a literature review to understand the landscape of recent publications on innovation, patenting and their inter-relationships. The literature survey identified several studies on innovation and patenting.

Sampat et al^[6] published a paper on how patents affect follow-on innovation and used a case study of the human genome. Though they did not do a like-to-like comparison of the patenting dynamics of a specific gene or combination, they still found that patenting had no negative impact on follow-on innovation. There has also been debate on whether or not patents actually promote innovation. An article published by David Kline in the magazine IPWatchdog talks at length on the different arguments made by different thinkers^[7]. The article concludes that patenting encourages technology innovation.

Other studies like Global CCS Institute^[8] researched on how patents can be used in several ways to support and monitor innovation. Archibugi^[9] also established that patents are an indicator of invention and innovation but, as with other indicators, they have their pitfalls. All these studies confirm the linkage between patenting and innovation and that they are interrelated and play a major role in determining their impact on each other. Based on this research, the author decided to conduct a case study on a well-known product and chart the impact that innovation has had on its patent landscape.

Active innovation also necessitates a good management system to ensure that the innovations are managed profitably. Rasmussen and Hall conducted a study to provide insights into the adoption process associated with management innovation^[10]. The findings contribute to the development of an extended and refined model of the process of adoption of management innovation through the consideration of the labelling, sequence and transition of phases and episodes, and decision-making. Goffin and Mitchell published a book on Innovation Management which explains all the different factors and parameters that need to be considered for effective management of innovations^[11].

Mergers and acquisitions are a part of the business world. Atanassov conducted research on whether hostile takeovers have an impact on innovation^[12]. While the study shows that negative impact is present, the study also cites some remedial measures that organizations can take while contemplating such activities. Amess et al analyzed the impact of private equity (PE) backed leveraged buyouts (LBOs) on innovative output (patenting)^[13]. All these studies helped the author to undertake two case studies on innovation management practices; one case study of a well-known product and the other of an organization which underwent changes, to understand how the organization and the innovations changed under the influence of these changes.

3. Understanding the impact of Innovation on Patenting using a case study

The research discussed earlier demonstrates that IP rights play a major role in protecting innovations that are developed during the course of research. There are several forms of IP rights that are available, which focus on providing legal protection for various aspects of intellectual creativity^[14]. To understand the impact that IP can have on innovation, we will study a case where innovation played a major role in changing the product landscape, which in turn, led to changing the patent landscape.

We will explore this concept by taking a device from a product which many will be familiar with, a car. Many models of cars use different types of devices to improve the engine performance. Here, we will study the case of innovation involving a supercharger for a car. A supercharger is any device that pressurizes the air intake to above atmospheric pressure^[15]. Essentially, a supercharger is a compressor or a boosting device that takes in air and fuel, compresses it and upon sparking, delivers more power to the engine. Therefore, a supercharger can provide the power and performance of a bigger engine, while maintaining the fuel economy of a smaller engine. Here, we discuss the case of the roots type supercharger.

The historical study of the patent portfolio of the roots type supercharger shows that the device was designed and first patented in the late 1980s^[16]. A patent search using a web based tool on the history of the supercharger device shows that the supercharger production started with a basic supercharger design. Further investigation and analyses sheds light on the development of this technology over the years.

In a bid to understand the patenting activity, the technological advances associated with supercharger engineering were analyzed from the patents that had been filed in this technology art. A search found over 100 granted patents in this technology space over the decades, globally, with additional patent applications under review by various patent offices.

The patent analysis revealed that the technology research centred on some aspects of the supercharger. There were significant innovations around engine sizes (<1L to >7L), so that the supercharger could be made to adapt to different types of engines. There were improvements around the compactness or packaging of the supercharger. Some innovations brought about better noise, vibration and harshness control. Another significant portion of the innovation revolved around compliance with regulations, especially emission control (CO₂ reduction). There were significant material enhancement activities (coating technologies, light weight rotors etc.). Different car engine variants used different types of superchargers, like variable speed control (single speed, multiple speed control). Some innovations helped improve the thermal efficiency.

Many of these technological innovation developments were extensively patented over the decades. These technological activities were based on customer need, market demand and changing regulations, and led to creating additional benefits for a customer owning a supercharged car. As these innovations took place, the simple supercharger design evolved and developed into a set of complicated design features, servicing different types of engines for different uses. Over time, the competitive advantage offered by these technological advances were carefully protected by IP, especially patents, so that the new and improved designs can continue to offer an advantage at the market place.

As we can see, what started off as a simple design for a small market, grew into a complex design portfolio for several engine variants, gaining a multi-million dollar market, with a strong customer portfolio of most of the major OEMs (original equipment manufacturers) along with a patent portfolio of over 100 granted patents in several countries.

This case study on an exemplary supercharger patent portfolio can be represented by the following figure:

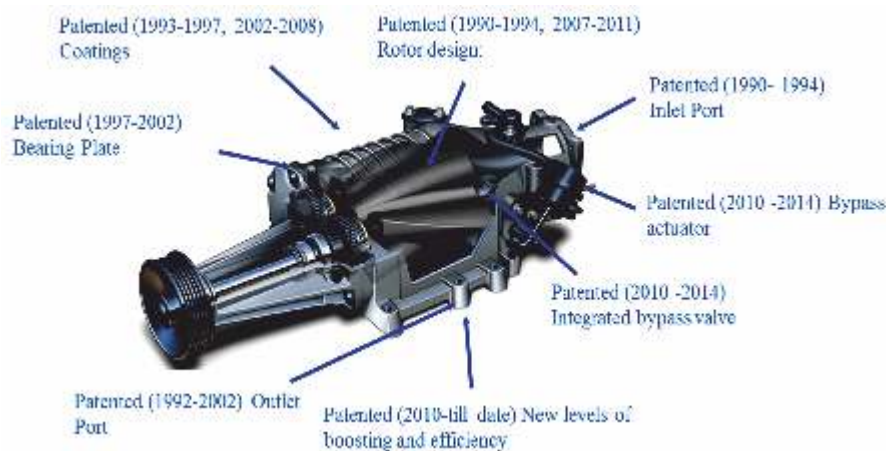


Figure 1: Representation: The changing patent landscape of a supercharger.
(Source: USPTO)

4. Understanding Innovation Management using case studies:

As we have seen in the supercharger case study, innovation is an important parameter to gain a competitive advantage and has been established to be a parameter for monitoring a company's technology activity. Since innovation also needs to be managed effectively so that inventions can be monetized, we describe in the following section how companies have promoted and managed innovation in their work places. We will examine two popular case studies to identify the principle aspects that companies have implemented to promote and manage innovations.

Case Study 1: Post-It® note

The popular product, Post-It® is a poster child for innovation. It was an unintended innovation and was ignored for a long time until a persistent scientist came up with an application for it. Despite this, the market success of the product languished for

years as the initial marketing campaign resulted in poor sales. Undeterred, 3M tried again to launch the product, this time with resounding success, making it a household product^{[17][18]}.

A Post-It® note (or sticky note) from 3M is a small piece of paper with a re-adherable strip of glue on its back-side, made from a low tack pressure-sensitive adhesive that made it easy to temporarily attach notes to documents and other surfaces. Dr. Spencer Silver discovered the formula for the sticky material back in 1968, by accident, when he was actually trying to make a different formulation. It was Silver's colleague, Art Fry, who finally came up with a practical use for it. The idea for repositionable notes struck Fry while singing in the church choir as his bookmark kept falling out of his hymnal, causing him to lose his page. So Fry developed a solution to his problem by using this formula. The trademark yellow colour of the notes came from the fact that the lab only had yellow scrap paper for testing.

After years of product development, 3M launched the product as "Press 'n Peel" in four major markets in 1977, but the result was disappointing and it failed as there were no actual samples. In 1978, at a customer convention, 3M launched the product at Boise, Idaho, with free samples of Post-it® Notes and after trying the notes, more than 90 percent of users said they'd buy the product. Until 3M's patents on Post-it® expired in the 1990s, 3M was the only company producing this product for worldwide consumption. This study demonstrates that legal protection ensures a competitive advantage, and protects the company's interest in monetizing the technology they developed.

Case Study 2: Bell Laboratories

Bell Labs has often been referred to as "The Idea Factory" or "The Crown Jewel"^[19]. Innovation is the story behind what was perhaps, the world's leading research organization in Information Technology and Communications. Bell Labs was behind many of the innovations that have come to define modern life, including the transistor, the laser, the fax machine, the silicon solar cell, Unix, communications satellites, the first cellular telephone systems and the first fibre-optic cable systems, etc.

In the twentieth century, Bells Labs was one of the most coveted institutions at which aspiring scientists could work. However, over the past 30 years or so, Bell Labs gradually lost its research edge. This happened despite its innovations and continuing research activities. Over the decades, Bell Labs won Nobel Prizes, Turing prizes and several other coveted prizes, along with creating a vast pool of intellectual property rights, including patents. The innovation management process at Bell Labs led to its success and the change to that management process caused a deviation in that success.

Several innovative leaders at Bell Labs have been responsible for its technological success. In this article by the New York Times^[20], the company held Mr. Mervin Kelly as one of the pioneers behind the creative and innovative culture of Bell Labs. Mr. Kelly believed that an "institute of creative technology" like his own, needed a "critical mass" of talented people to foster a busy exchange of ideas.

There are two kinds of research: Basic research and Applied research. Applied research is where the problem comes first and it may be possible to manage it. Here, a goal is set and the researcher can try to keep the research aimed at the goal. For some problems, years or even decades may pass before the solution is found, but at least there is a direction. In basic research, the solution comes first, sometimes even before anyone has imagined the problem. It's almost impossible to manage, because the managers don't know what the goal is. Years or decades may pass before anyone thinks of a situation where this solution that the researchers have found, can be used.

Bell Labs had a rich history of producing new and ground breaking technological advances. Much of this research was basic or foundational research. The reality behind conducting basic research is that the outcome cannot be predicted. Management principles direct the prediction of the outcome of research, so that the result can be directed in a particular manner so as to reach a desired target or monetary value. Since the financial potential of the result cannot be predicted for basic research, as the possible applications using this research may still be unknown, any manipulation may not result in the desired monetary profits immediately.

In the initial decades of Bell Labs, the focus was on basic research. Let us take the example of the hologram, which received a Nobel Prize. Initially, it was thought that Holograms can be used for 3-D photographs. However, the current uses include lenses, laser pointers, the lithographic tools that make integrated circuits and many other applications. In another example, lasers were invented and the suggested application was to drill holes in diamonds to make dies for pulling wire. However, these days, (depending upon the type of laser) lasers are used for a variety of applications including DVD players, for cosmetic purposes etc., applications that were not even imagined when the laser was first discovered.

As Bell Labs grew, too many ideas were produced for a single company to handle, and adequate funding may not have been available to realize all inventions into products. Also, some of its innovations (eg. transistor) altered the technological landscape so much that its core business was reduced to a small part of the ever-expanding field of information and electronic technology.

Amongst other problems that Bell Labs encountered were the many companies that acquired it over the course of time. The focus of each acquiring company was different, which pulled Bell Labs' research wing in different directions. For example, AT&T acquired the company in the '80s; AT&T was forced by the US Federal Government to break up the company into separate parts, and restricted their trademark usage. Everything Bell Labs had ever made for AT&T had been channelled into a monopoly. Bell Labs and AT&T had never really had to sell anything. When they did try to sell, as was the case with the Picture phone, they were not successful in selling the product. As a result, AT&T had difficulty competing in the market.

In the '90s, AT&T spun off Bell Labs to Lucent Technologies. In the early 2000s, Lucent Technologies merged with Alcatel. Over the periods of transition, Bell Labs began to shed good people, who either left to go to new R&D organizations to assist local phone companies, or departed for academia, thereby creating competition.

As Bell Labs changed hands, the focus on Basic research was replaced by Applied research and the focus on creating great technology was replaced by making profits. These changes could have led to conflicts with the philosophy under which Bell Labs researchers had worked. The difference could be that the focus became more controlled and the focus of the future became short-term thinking rather than long-term thinking.

5. Managerial Implications

The author has discussed three case studies: one case study where the impact of innovation was instrumental in changing the patent landscape, and two case studies which try to explain the impact of innovation management and highlight some inferences that may enable R&D, strategy and operations managers to plan their budget and resources to encourage innovation in their organizations, so that they can create a market differentiating product that can capture a larger or new market share. Protecting these innovations effectively by using various IP rights would ensure that the innovations continue to generate revenue for the company.

The supercharger case study highlights the fact that systemic innovation can alter the product itself, helping to gain a competitive advantage, and emphasizes the need for IP protection, so that the company can protect its inventions in order to monetize them. Studies of the changing product and IP or patent landscapes can help us understand the relationships between markets, inventions and other dynamics that help in bringing about such changes.

The innovation management case studies of Post-It® and Bell Labs illustrate some factors that are important for R&D and strategy managers. One implication is that some innovations may be the result of unintended consequences. A company may be best served by encouraging testing of disruptive inventions, some of which may become successful innovations. The invention to innovation journey has to be carefully planned and executed.

Other implications include the fact that innovation need not necessarily follow a set path; for innovation to thrive, an innovative culture is required; innovation is not necessarily most fruitful when profit making pressures channel research; and any change in the culture or philosophy of an acquisition has to be managed, so that some of the reasons that made the acquisition attractive, are not lost in the transition. In one case, the innovation processes were successful, as the invention could be converted in a highly profitable product. In another, despite the best of intentions, innovation processes, which resulted in highly innovative products, could not be managed profitably, which led to many losses.

6. Conclusion

Innovation can change a technology landscape resulting in new product introductions that may be designed for meeting an identified need, or some future need in a market yet to be identified. Successful innovations are repeatable and scalable, so that they can be profitably monetized. It is necessary to ensure that Intellectual Property Rights are secured using a combination of: Patents, Trade Marks, Copyrights etc., depending upon the subject matter.

The lesson learnt from the supercharger case study is that systematic innovation can change the direction of the patent

landscape. Product development changes in response to changes and advances in innovative technology. These changes benefit both the innovator as well as the consumer. Systemic innovation that is applied to alter a product, and the resulting IP rights protection, can help to gain a competitive edge over competing products.

It is also demonstrated that sometimes innovation can be unintended. Disruptive inventions should be encouraged so that they can get the chance to become successful innovations. The journey to innovation is a journey that has to be carefully planned and executed. It is also observed from the Bell Labs history, that for innovation to thrive, an innovative culture is required. Innovation that is constrained by profit making pressures, can eventually lead to the failure of the process, thereby leading to financial and manpower losses. Also, any change in the culture or process should be managed carefully.

The case studies discussed here help us understand some dynamics of the relationships between inventions, innovations and management of innovation. Further research would help to understand the innovation methodologies that can sustain in different environments, across different types of technologies under dynamic market conditions. Also, a study of the changing product and IP or patent landscapes can throw some light on the market and other dynamics that help in bringing about such changes.

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