

Role of Intellectual Property in Innovation and New Product Development

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*"...Because its purpose is to create a customer, business has two—and only two functions: **Marketing and innovation**. Marketing and innovation produce results, all the rest are costs."*
Peter Drucker

Innovation

Generally put, an ‘innovation’ is developing a new idea **and** putting it into practice. As this article is focused on the competitive strategy of a private enterprise in a market-driven business environment, the term ‘innovation’ is used here to refer to the process of bringing valuable new products (goods and services) to market i.e., from the idea/concept formulation stage to the successful launching of a new or improved product in the marketplace², or the result of that process, so as to meet the explicit or implied needs of current or potential customers. In other words, through innovation an enterprise seeks to deliver unique new value to its customers. In this context, ‘marketing’ is the understanding of that unique new value and communicating it to the current and potential customers of a business so that the product sells itself.

Technological innovation may be classified in several ways: product vs. process, radical (basic or fundamental) vs. incremental (improvement), and disruptive vs. sustaining (sequential and/or complementary). Other important types of (non-technological) innovations that do not result from scientific and/or technological R&D, but are often crucial for profitably marketing the products and services resulting from the investment made in R&D are: marketing innovation, institutional innovation, and complementary innovation.

In this article, however, the focus is on technological innovations. Nowadays, it is generally accepted that in a knowledge-driven, competitive business environment, technological innovation (hereafter, for the sake of simplicity, simply called ‘innovation’) is a principal determinant of successful firm performance. But differences of opinion persist amongst economists and policymakers about the exact role of intellectual property (IP) in relation to innovation. On the one hand, in theory, the IP system is considered to be absolutely necessary “to encourage creative intellectual endeavor in the public interest,”³ and on the other, some observers believe that, in practice, the IP

¹ The opinions and views expressed in this article are solely those of the author and should not be attributed to WIPO. Any comments or suggestions pertaining to this article may be sent to christopher.kalanje@wipo.int. Many thanks to Guriqbal Singh Jaiya for his most valuable guidance and comments.

² This can basically be called a Schumpeterian approach to innovation. See Cantwell, J. “Innovation, Profits and Growth: Schumpeter and Penrose”

³ Ricketson, Sam., *New Wine into Old Bottles: Technological Change and Intellectual Property Rights*, ed. Drahos Peter “Intellectual Property”, second series, p. 389.

system hinders competition to the extent that it is often seen to be playing a negative role in innovation.⁴ Hence the need for a systematic and periodic study and review of the actual use by businesses of the tools of the IP system so that economists are able to provide empirical, evidence-based guidance to policymakers to adapt the IP system so that it continues to serve the conflicting private and public interest in spurring further innovation and its wide diffusion in the shortest possible time. This article, however, does not deal with these otherwise important aspects.

Managing innovation better than its competitors is one of the main objectives of a business that wishes to survive and thrive in today's economy. By relying on practical examples, this article highlights the important contributions made by the effective use of the different tools in the IP system to the process of taking innovative technologies to market, through launching of superior products and/or services. For explaining the role of the tools of the IP system, it goes beyond merely looking at technological innovation as either radical or incremental technological breakthroughs. Instead, it looks upon technological innovation as an interactive process made up of a number of distinct stages. It begins with the formulation of a novel idea/concept and, through a series of stages, ends in the successful launching and marketing of a new or improved product in the marketplace. In other words, it looks at practical IP issues of relevance to different stages in the whole new product development process in which technological innovations may be introduced at different stages of the value chain from the producer to the end user.⁵ For the sake of simplicity, it focuses on the idea stage and the research and development stage.

Intellectual Property, Inventions and Innovations

So, what exactly is IP? Broadly speaking, the term 'IP' refers to unique, value-adding creations of the human intellect that results from human ingenuity, creativity and inventiveness. An IP right is thus a legal right, which is based on the relevant national law encompassing that particular type of intellectual property right. Such a legal right comes into existence only when the requirements of the relevant IP law are met and, if required, it is granted or registered after following the prescribed procedure under that law. In practically all countries the world over, a national legal system of intellectual property rights have evolved; this has been created over varying periods of time during the last 150 years or so. It has enabled the grant of property-like rights over such new knowledge and creative expression of mankind, which has made it possible to harness the commercial value of the outputs of human inventiveness and creativity. This is usually done by its orderly use, exchange or sharing it amongst various types of business partners

⁴ Boldrin, M., and Levine, D.K., 2002, The Case Against Intellectual Property

⁵ See TechnoRoadmap Inc. White paper: "Tactical IP Management during your New Product Development (NPD) process" Figure 3 at <http://www.techroadmap.com/Newsletters/Tactical%20IP%20Management%20Whitepaper.pdf> . (February 28, 2005)

in a complex network of strategic relationships that generally work harmoniously during the new product development process for creating and marketing new and improved goods and services in domestic and export markets.

The grant of a property right by the government, albeit generally for a limited period of time, over useful intangible intellectual output provides the owner of such legal property rights the *right to exclude* all others from commercially benefiting from it. In other words, the legal rights prohibit all others from using the underlying IP asset for commercial purposes without the prior consent of the IP right holder. The different types of IP rights include trade secrets, utility models, patents, trademarks, geographical indications, industrial designs, layout designs of integrated circuits, copyright and related rights, and new varieties of plants.

While innovations are concerned with the commercialization of new ideas; in contrast, an 'invention' may not be directly associated with commercialization.⁶ As such, innovation may be seen as a process of interaction and feedback during the various stages of the new product development process. An invention is considered as the generation of a new idea or knowledge, which aims to solve a specific technical problem. Inventions could relate to products or processes and are characteristically protected by trade secrets, utility models/petty patents or patents. Utility models/petty patents or patents are granted/registered under the relevant national/regional law by the relevant national or regional patent office. As not all inventions are commercialized, so it is clear that not all inventions result in innovations. A lot of new ideas are created or born but, quoting Brandt (2002), "Most die a lonely death, never seeing the light of commercial success."⁷

Technological basic or fundamental innovations produce new markets and new industrial branches for a new product. Such an innovation is also described as a radical or disruptive innovation. An improvement innovation (also called an incremental, sustaining, sequential or complementary innovation) would lead to an improved product over its ancestor in terms of quality, reliability, ease of use, environmental protection, raw material use, labor cost, and so on. It may also include the application of new and better production processes or techniques that allow old or new products to be made more reliably, of better quality, or simply in larger quantities, or at a lower price. Trade secrets, utility models/petty patents and patents are relevant for protecting, managing, exploiting and leveraging both basic and improvement innovations.

An innovative new or improved product that meets customer expectations offers an existing or new business, new market territory without competition for so long as it retains its innovative advantage. The IP system plays a significant role in helping a business to gain and retain its innovation-based advantage. As a consequence, the competitive edge that an entrepreneurial business may gain with a basic or disruptive innovation is likely to be longer lasting than that obtained merely from an improvement innovation, assuming that the technological barriers to competitors taking advantage of

⁶ Mark Rogers, 1998, The Definition and Measurement of Innovation, p. 5

⁷ Brandt, J. L., Capturing innovation: Turning Intellectual Assets into Business Assets, p66

similar innovations are approximately equivalent, since a basic innovation establishes a new class of product or service, entry of competition requires that the opportunity provided by that class is recognized by a potential competitor before it attempts to enter the market. In the case of an improvement innovation, not only are competitors for the class of product already in place, but since the improvement innovation typically amounts to a better, faster, or cheaper way to build the product, its advantages are far more quickly understood and replicated.⁸ Hence the need to use the tools of the IP system for both types of innovations; except that generally there is a need for devising an offensive IP strategy for a basic innovation versus a defensive IP strategy for an improvement innovation.

A survey of economic studies reveals that patents are the most preferred IP rights in relation to technological innovations. This seems to be due to the use of the terms ‘innovation’ and ‘invention’ as synonyms. This may explain why studies on innovation have, in many cases, treated patents as proxy input for innovation.⁹ To be specific, the *number of patents* owned by an enterprise has often been used as one of the main indicators for determining *innovation intensity* of that enterprise. In addition, patents are also used as a measure of *output of innovation*. However, while such an approach is useful, it does not look at the “big picture” about the important role of the whole IP system, including the subsystem of enforcing IP rights (comprised essentially of the police, customs authorities and the judiciary), in facilitating the success of innovation in the marketplace. In this article, however, the focus is limited to all IP related actions that must be taken within an enterprise at different stages of the new product development process or cycle for using the different tools in the IP system for market success.

Innovation as a process, therefore, requires effective participation of individuals from different sections/divisions of an enterprise, such as technical experts in R & D, marketing, management, finance, legal, etc., apart from outside consultants, suppliers, outsourced component manufacturers/service providers, business partners and lead users. However, for the sake of simplicity, it is assumed in this article that all actions concerning innovation in relation to new product development happen within an enterprise.

An enterprise would be well positioned to benefit from innovation if it takes into consideration from the initial stage of the new product development process the full range of IP issues. This is true whether the decision to innovate is taken as part and parcel of the overall business strategy, one-off development of a new idea, or as a reaction to developments in the marketplace.

⁸ William F. Zachmann, <http://www.wfzachmann.com/Book86/Book86Chapter01.htm>

⁹ Kemp, R., Folkeringa, M., De Jong, J., and Wubben, E., Innovation and Firm Performance: Differences between Small and Medium-sized Firms

Role of IP in Innovation

As there are many players involved in facilitating the market success of an innovation, the effective use of the tools of IP will play an important role in reducing risk for the players involved, who may then be able to reap acceptable returns for their participation in the process. IP plays an important role in facilitating the process of taking innovative technology to the market place. At the same time, IP plays a major role in enhancing competitiveness of technology-based enterprises, whether such enterprises are commercializing new or improved products or providing service on the basis of a new or improved technology.

For most technology-based enterprises, a successful invention results in a more efficient way of doing things or in a new commercially viable product. The improved profitability of the enterprise is the outcome of added value that underpins a bigger stream of revenue or higher productivity.

Perception of Innovative Ideas

Whether an enterprise's decision to innovate has been influenced by the overall business strategy (e.g. growth through innovation) or a reaction to developments in the market-place, it is imperative that an innovative idea must be treated as a secret if an enterprise wishes to appropriate potential commercial benefits from the idea (i.e. the information surrounding the creation of the idea must be protected carefully as a *trade secret*). It should be noted that not all commercially viable ideas can be or will be patented¹⁰, hence the importance of treating ideas as trade secret, in particular at the inception stage.

Empirical evidence indicates that generally small and medium-sized enterprises (SMEs) are more inclined to use trade secrets rather than patents as a form of protecting their inventions to stay competitive¹¹. The main reasons given by SMEs for shying away from patenting their inventions include high costs and complexity of the patent system. A study on patenting activity in Australia indicates that 44% of the firms used patents while 74% used trade secrets as a way of protecting their ideas. It also showed that size was an important factor in determining the propensity to patent, i.e. 35% of small firms with less than 20 employees used patents, while 75% of firms with more than 500 employees patented their knowledge¹².

In some cases, while patenting-related costs and complexity of the patenting process (especially relating to 'prior art' search and to the drafting of patent claims) may be seen to hamper innovation (particularly in cash 'strapped' SMEs), it is equally true that if used strategically (i.e. in a patent-friendly business environment for SMEs or in partnership with others) patents can become a dependable source of new, additional or higher revenue for SMEs. For an idea that may result in a patentable invention, the ultimate

¹⁰ Mark Rogers, 1998, The Definition and Measurement of Innovation, pg. 14

¹¹ *ibid.*

¹² Mark Rogers, 1998, The Definition and Measurement of Innovation, pg. 14 (Footnote 9)

choice between the use of either the trade secret route or the patent route for protecting it should be seen as a strategic business decision that should be taken only at a later stage of its development when all the requirements of patentability are met, namely, statutory subject matter, novelty, inventive step/non-obviousness, capable of industrial application, and adequate disclosure. At that stage, the choice would depend on the nature of the invention, its business potential, the nature of competition, the possibility of its independent creation by competitors and the ability of competitors to reverse engineer it easily from the product developed by using it. It should, however, be pointed out that whatever the ultimate decision, initially it must be protected as a trade secret so that, later on, a part of it may be patented and the rest of it may still remain as the associated trade secret and know-how, or tacit knowledge owned by individuals that are associated with the patent.

Technical drawings, which are in most cases part and parcel of technological innovations, are protected as trade secrets and/or by copyright. It is important for the drawings to be dated so as to establish the date of creation. Technical drawings could also, at a later stage, form an important part of the relevant patent application.

The information contained in existing patent documents (patent information) plays an important role in the conception, screening and development of an idea. Such information can provide useful insight into whether an idea is new or not (state-of-the art) and whether to proceed further in developing an idea. Furthermore, proper analysis of patent information may provide an insight into the strategy of potential competitors and about technology trends.

Research and Development Stage

Several indicators have been used to measure the efforts of an enterprise in undertaking research on and developing innovative ideas. These include, expenditure on research and development (R&D), information on innovation, total sales, firm size, innovation strategies, etc.¹³ These indicators are directly or sometimes indirectly influenced by IP. The IP tools used during the “conception of an innovative idea” stage continues to be relevant also during this stage. Thus, trade secret continues to be relevant, especially if the enterprise is yet to decide on whether to file a patent application.¹⁴ Keeping trade secrets continues to be relevant during the entire R&D phase, as one would not want the competitors to ever have access to vital information. If used by such competitors it would result in the erosion of a competitive advantage, derived from the final product.

During this period, researchers should periodically consult several sources of information that would provide input for the success of their project. Patent documents continue to be a relevant source of information that is often grossly underutilized. The European Patent

¹³ Kemp, R.G.M et al call this stage as innovation intensity, p.7

¹⁴ See example of Australian camera man Jim Frazier who signed a confidentiality agreement with Panavision, regarded as the best lens manufacturer in the world, before he showed them his invention http://www.wipo.int/sme/en/case_studies/frazier.htm

Office (EPO) estimates that 70% of the information in patent documents is not available elsewhere,¹⁵ and with more than 800,000 patents granted annually around the globe it does not take a “rocket scientist” to realize the wealth of information available in patent documents.¹⁶

Patent documents provide useful information on the state-of the art, which would enable an enterprise to avoid unnecessary wastage of resources, in terms of money and time, during the R & D process, thereby hopefully reducing the normally high R & D costs. Patent information can also provide useful information, which can lead to product improvement or to design-around inventions, which may help to “short-circuit” the lengthy time frame often required to take a new product to the market.

Unfortunately, for their business needs, many SMEs do not use patent documents as a source of competitive intelligence. SMEs, particular in developing and least developed countries, should be made aware of and be equipped to use business, legal, and technical information contained in patent documents, which is in the public domain to come up with innovative product, which have been adapted to local conditions.

Once an enterprise decides to rely on a utility model or a patent to protect its output of research and development, it must initiate the required process, e.g., file a utility model/patent application. Such a move would facilitate the establishment of filing date for determining the priority date and for claiming exclusive rights over the output even before a patent is granted (unless on absolute or relative grounds the patent office refuses to grant a patent). Most R & D results in both functional and aesthetic improvements. For protecting and leveraging new or original designs, which are solely judged by the eye, one should proceed with the industrial design registration process at the national/regional design office set up under the relevant national/regional design law.

IP as Life-line While Passing Through the “Valley of Death” of Innovation

In most cases, innovative technological ideas require further technical development so as to make them successful in the marketplace. SMEs and other small technology-based innovative enterprises may not have the technical resources and facilities to undertake such development, for example, for the development and testing of prototypes. The protection of such ideas by IP rights ensures that these are not “lost” while taking advantage of external technical resources and facilities owned by innovation centers, technology parks, universities, research institutes, and other (big) companies. Furthermore, in the future development of an invention/design and taking it to the market through partnerships (such as, joint ventures, strategic alliances, licensing agreements, merger or acquisition) the ownership of IP provides a strong negotiating position in the process of getting into such a partnership. Both parties would also avoid potential future conflicts if ownership of IP issues were resolved initially with clarity. Inventors, be they

¹⁵ The EPO Guide on Patent Information on the Internet, p. 7
http://epart.epo.org/dwl/espacenet_manual.pdf (August 13,2003)

¹⁶ See example of FK Biotecnologia S.A at http://www.wipo.int/sme/en/case_studies/fk_biotech.htm

independent or employed, are not necessarily skillful marketers or manufacturers; furthermore, even the best products need the best marketing skills to succeed in the marketplace.¹⁷ In most cases, taking a product to market has proven to be a big challenge to inventors, entrepreneurs, and enterprises, especially SMEs; hence the existence of the concept of “valley of death” in innovation (the “valley of death” normally starts from the period an invention has been made to the launching of a new product/process). This is the period where most inventions collapse due to the absence of external support or are found to be not commercially viable.

IP, particularly patents, often play a crucial role in facilitating access to business angels, providers of early stage capital, including seed capital, venture capitalists, financial institutions, and the like who/which may provide a “lifeline” for an invention to reach the marketplace. As an example, take a look at the invention of Xerography. In 1937, Chester Carlson invented Xerography, which he patented in 1939. It took almost eight years for Carlson to find an investor who was willing to invest in the invention. Finally, the Haloid company (which later became the Xerox Corporation) successfully made the invention commercially available in 1950.¹⁸ It would be fair to suggest that the existence of a patent held by Carlson significantly contributed to Haloid Company’s decision to support the invention. Most potentially innovative ideas end up in the valley of death. Those ideas, which are protected by IP, stand a greater chance of surviving through the valley of death. In most cases, for successfully crossing the “valley of death,” an invention often needs external help in terms of funding, technical knowledge, marketing, etc. IP ownership plays an important role in influencing the decisions of external partners as to whether to assist in navigating through the “valley of death.”

IP rights provide the holder with several opportunities, which can facilitate the successful completion of an innovation. Such opportunities include sale, licensing, and various types of strategic business partnerships or alliances in commercializing it.

IP rights can also facilitate the establishment of joint ventures. SMEs facing serious financial constraints but rich with IP assets may find this form of partnership strategically useful. Ownership of patent and trade secrets may play a crucial role in attracting potential partners. Sometimes, an enterprise with patented product and/or valuable trade secrets may find it strategically beneficial to enter into a joint venture arrangement with an enterprise with a strong trademark so as to secure more sales.

Paying close attention to what competitors are doing while seeking to take advantage of its own IP assets may prove a worthwhile strategy for an enterprise seeking ways of crossing the "valley of death". Owners of innovative ideas protected by IP rights may find it relatively easier to enter into strategic alliances with favorable terms and conditions. Such enterprises may benefit by getting access to R&D facilities owned by its partner or to distribution channels and sales networks. An enterprise may also benefit from further development of its IP protected product(s), as part of the strategic

¹⁷ Fisher Philip. A. Common Stocks and Uncommon Profits, p. 124

¹⁸ For more information visit <http://inventors.about.com/library/inventors/blxerox.htm>

arrangement.

Venture capital investors play an important role in providing the much-needed funds, which enable enterprises to cross the "valley of death" safely. A well managed IP portfolio may significantly contribute in influencing the decision of a venture capital investor if the business plan and strategy of an enterprise indicates actual or potentially effective use of IP rights that would enhance its potential for generating future revenue, market control or developing a strong market position and its competitiveness.

Marketing of Innovations

Since successful innovation includes taking a new product to market, other IP tools become very relevant. Above all, trademarks and industrial designs play an important role in the marketing process. These enable consumers to identify a product/service of a particular company and enable them to distinguish the product from other similar product.

A trademark is a useful tool in launching new product segments or entirely new products, technologically based or non-technologically based, i.e., through brand extension. In addition, trademarks can be very effective in penetrating new markets. Honda, for example, took advantage of its reputation in motorcycle engineering to penetrate the US car market¹⁹.

Trademarks are also useful in extending commercial benefits beyond the life of a patent. The case of Aspirin[®] provides a good example. Developed in 1897 by Felix Hoffman, a research chemist working with Bayer Company in Germany, the drug was patented in 1899 by the Bayer Company. Knowing that patents have a limited duration, the Bayer Company embarked upon promoting a trademark for its new product. When the Aspirin[®] patent expired, the company continued to benefit from the sale of aspirin through its established trademark Aspirin[®]. The Bayer Company has also used the two-track IP strategy, i.e., using a trademark to protect market share after the expiry of a patent, for its Cipro[®] product (ciprofloxacin for treatment of infections, including anthrax).²⁰

Technological innovation can also be supported well by a combination of patent, industrial design and trademark. A look at the invention and development of the vacuum cleaner provides a good example of strategic use of a combination of different types of IP tools, namely, patents, industrial designs and trademark.²¹ In this case, one can see how the innovation is enhanced by the use of the three tools of IP protection.

Trade secrets, patents, trademarks, industrial designs, and copyright may separately or jointly facilitate the acquisition of technology and its commercial use. Strategic use of a

¹⁹ Mendonça S. et al., Trademarks as an Indicator of Innovation and Industrial Change, p.7

²⁰ Established brands, http://www.panopharma.com/established_brands.htm

²¹ James Dyson's History of Great Inventions ed. Robert Uhling pg. 132. Also visit <http://inventors.about.com/library/inventors/blvacuum.htm>

combination of IP tools in the innovation process can significantly contribute to facilitating the appropriation of higher profits, maintenance of a premium market position, thus enabling technology-based, innovative SMEs to have a high return on investment.

Conclusion

Innovation is not the same as invention. Innovation is a process, which begins from the conception of an idea to the launching of a new product/process in the market place.

Intellectual property rights can be used effectively to facilitate successful innovation. Innovative technologies stand a better chance of successfully reaching the marketplace if IP is used strategically. Gauging the importance of IP in innovation, by merely focusing on patents as input and/or output of innovation, does not do justice to the significant role that can be played by the other tools of IP. A broader approach to the contribution of IP in innovation is therefore needed.

IP also plays an important role in safely navigating the "valley of death". It provides access to financing and technical facilities. In addition, IP provides a strong negotiation position when it comes to entering into and maintaining business partnerships.

Several examples have been given of businesses that have profited by exploiting the role of IP in innovation. More examples on the role of IP, not only on innovation but also in business in general and in particular by SMEs, are found under case studies at <http://www.wipo.int/sme>.
