

IP And Open Innovation: Managing Technology Push And Pull

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Abstract

Growing technology convergence and speed to market drives the need for a broader set of accessible technologies and IP. This creates market opportunities for increased technology collaboration, as some firms and organizations can find expanded uses for their existing technology portfolios (i.e., technology push), whereas other firms look to resolve innovation gaps from sources outside of their own in-house operations (i.e., technology or market pull). Firms need to generate a sophisticated understanding of their future innovation needs based on an integrated approach that combines business, technology and IP strategy. All technology driven firms are pushed to move from a closed to an open approach to innovation to remain competitive. To succeed, they need to consider all possible sources of innovation, both for development and commercialization. Fundamentally, open innovation is a strategic IP management approach that needs to be governed explicitly, not implicitly.

Introduction

Our emerging connected, digital economy has resulted in the introduction of new products, services, and business models with ever-increasing complexity, speed, and geography. Over the last 20 years, the amount of money invested in R&D has tripled, with China having passed the EU and now almost on parity with the U.S.¹ Not only the amount of money that is put into R&D globally is increasing, but also the nature of innovation has changed. More discrete technological innovations, such as steam engines, telegraphs, light bulbs and the telephone and automobile, have given way to convergent, multi-technology products with both increased complexity and speed to market. Technology adoption cycles that used to take 40 to 50 years or longer now are in the range of one to two years.² Firms that miss the window of opportunity and enter the market late are already on the cost down-curve. The combination of increased R&D costs and quick reduction in pricing makes it more challenging to achieve a proper return on investment through innovation.

The increased complexity and speed to market has rendered the traditional closed innovation models, whether push or pull, obsolete. For convergent hardware products, such as smartphones, healthcare equipment, and modern, connected vehicles, firms don't have the time, resources and often capabilities to develop all necessary

technologies in-house. So, they are more or less forced to look to external actors to help them to speed up their own innovation to remain competitive. This process is often referred to as open innovation, in particular, from the perspective of technology development.³

To meet this challenge, firms need to interact with a broader ecosystem of actors to enhance both technology development and commercialization (i.e., both input and output). This includes looking beyond traditional sources of innovation and traditional market segments, transforming the firm from a closed to an open innovation actor. In this article we will discuss this transformation from a technology push versus (market) pull perspective, highlighting key issues and insights from the context of open innovation, which is fundamentally an intellectual property management (IPM) capability.

Technology Push vs. Pull

One traditional perspective on innovation is the model of technology push versus pull, the latter also called market pull. In this model, a firm either starts with the development of a technology-based product or service and introduces it on the market (i.e., push), or it starts with an articulated need from the market and develops or identifies a technology to address the market demand (i.e., pull). As an example of the former, Henry Ford is purported to have said with respect to the development of the automobile "if I'd asked people what they wanted, they would have said a faster horse." Ford's subsequent failed launch of the Edsel has become synonymous with the potential downside of predicting market needs.⁴ History is littered with failed visionary attempts at technology push even by some of our most successful firms and entrepreneurs.⁵ To put it succinctly, technology push is a hypothesis that needs to be tested on the market.

Technology (or market) pull, on the other hand, would seem to be the apparent model, except for the inconvenient truth that customers often are unable to articulate

3. Chesbrough, H., Vanhaverbeke, W., & West, J. (Eds.). (2006). "Open Innovation: Researching a New Paradigm." *Oxford University Press*. Defines open innovation from an industrial context as "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. [This paradigm] assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology."

4. Bonsall, Thomas E. (2002). "Disaster in Dearborn: The Story of the Edsel." *Stanford University Press*.

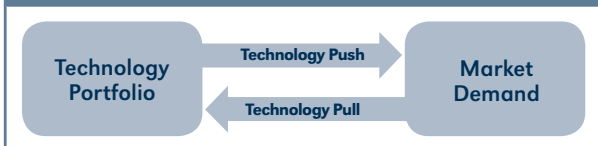
5. For example, the Apple Newton and Google Glass.

1. <https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm>.

2. <https://hbr.org/2013/11/the-pace-of-technology-adoption-is-speeding-up>.

what they really want.⁶ Usually, their real needs are latent and only known once products and services are launched on the market. Again, history is populated with failed attempts to address market needs that only hypothetical customers wanted, not real customers.⁷ A simple illustration of the technology push and pull model is shown in Figure 1.

Figure 1. Technology Push Versus Pull



From IP-Supported Technology Push to Open Innovation

From a technology push perspective, when a firm moves from a closed innovation to an open innovation model, it seeks to find new ways to commercialize its technology outside of its initial intention when created,⁸ traditional market or business model. For industrial firms, this typically includes licensing-out, spinning off new firms, and creating joint ventures. For university technology transfer offices (TTOs), taking technology that emanates from academic research and pushing it out on the market is the primary business model for their third mission, the facilitation of innovation. Technology push doesn't mean that there is no understanding of the market. It is just about a different starting point. Obviously, research conducted on diabetes or graphene, for example, is done with an understanding of potential practical applicability. Still, it's most likely that these research programs will not have started with a particular market application or commercialization strategy in mind. For the case of digital services/platforms, the use of minimally viable products (MVPs) allows developers to iterate quickly between technology push and pull and promptly release new versions based on customer feedback. It is great for digital products but it's a little challenging to do this for drug development (*i.e.*, minimally viable cancer drugs). Thus, different technology sectors have different applicable technology-based business models.

Applying technology push from an IP licensing perspective requires us to understand the nature of the IP and the type of transaction. The traditional starting point is that a firm has accumulated a portfolio of patents that it is not effectively monetizing. This situation was the premise of the seminal book on the topic titled, *Rembrandts*

in the Attic by Kevin Rivette, which was first published in 2000.⁹ However, it is not evident that patented technology created from a push perspective has any value at all. In other words, patents don't have a value in themselves. From an open innovation perspective, this means that the value of your patents is dependent on how others (*e.g.*, licensees) view them. This raises a few basic questions:

- Is your technology useful for others? If you've created technology for your own purpose and you can't put it to use, why would it be useful for others?
- Do your patents actually cover valuable technology features? Oftentimes, patents are drafted with one particular application of the technology to one specific business in mind. However, over time, the technology may become more relevant to other applications in the same business or in adjacent or completely different businesses, resulting in patents that don't anticipate that evolution losing their value.
- Do others want to pay for your patents? The answer to that is typically no, not for the patent only. If there is no added value due, they won't pay if they don't have to. In today's patent climate in several industries, one has to litigate to be taken seriously.¹⁰

The last bullet above brings up an interesting point about the difference between *technology vs patent licensing*. If you're pushing a new technology towards specific market actors who don't fully understand the technology but agree that it would create value (*i.e.*, technology licensing), then collaboration will likely be welcome. However, if they already understand and deploy the technology, and all you're trying to do is license them the patents (*i.e.*, avoid infringement), that will typically be an uphill battle, as market actors will always try to avoid paying for something that they already understand and use. This will, of course, vary depending on the strength of the patent jurisdiction.

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6. <https://hbr.org/2018/09/why-design-thinking-works>.

7. See Ulwick, A. (2005). "What customers want." *McGraw-Hill Professional Publishing*.

8. <https://www.mentalfloss.com/article/57861/11-successful-products-originally-invented-something-else>.

9. Rivette, K. G., & Kline, D. (2000). "Rembrandts in the Attic: Unlocking the Hidden Value of Patents," Harvard Business School Press. Boston, Massachusetts.

10. EPO SME Case Studies, "FRACTUS Snowflake Pattern Precipitates New Application For Antennae," 2017, ISBN 978-3-89605-175-2, epo.org/sme.

This means that, in practice, technology push is entrepreneurship. One does not merely hold up technology, and people come running. It requires real business development effort that is not easy to accomplish as a side activity in the patent department. On the other hand, patent push is different than technology push—it's litigation. Patent licensing will invariably be met with two statements, (1) "No, we don't infringe," and (2) "your patents are invalid." If a patent holder lowers their price, the incentive to challenge the patent by the user also lowers. For example, no licensee has ever questioned the validity of a patent in a royalty-free license. Therefore, it is actually how you plan to use your patents practically on the market that determines agreement on their validity, and any "excessive" price would lead the user to try to challenge the patent's validity. So, it's this game that you need to understand when you want to monetize your patents outside of a broader technology collaboration.

From IP-Supported Technology Pull to Open Innovation

Open innovation in the concept of collaborative technology development requires a change in mindset. From an R&D perspective, firms must overcome the need to try to create everything in-house (*i.e.*, not-invented-here syndrome). Thus, technology pull (also called market pull) is not only about understanding the customer on the product market, but also potential suppliers on the technology market. From an innovation perspective, firms must realize that all collaboration activities with external actors are an intellectual property issue. In essence, open innovation is another name for advanced intellectual property management (IPM).

So how is this done in practice? How do you know what to look for? First of all, firms need to determine their long-term business strategy; in particular, they need to define what technologies they may need as a consequence over a five-to 10-year time frame based on potential business cases and scenarios. And, of course, once they have defined their business strategy, that should also be reflected in their IP strategy (in particular, defining what IP they will need to support these technologies and their business cases). IPM, in this context, is a proactive process that, when informed by business strategy, creates a strategic input to the firm's R&D strategy as well as technology acquisition. The goal is not to simply patent what results from the R&D process, but to develop technologies that are protectable so as to create future control points in the market. One can see IPM in this model as a control perspective on innovation to ensure that the technologies created can be leveraged to create a sustainable benefit for the businesses so that they can grow faster or can become

more profitable. The key is to manage IP as both a key input to steer the direction of the business and technology development process, as well as an output that results in a viable control position. The latter will typically require a portfolio of control mechanisms, including various IPRs, to achieve. Experience has shown that we still have a long way to go before businesspeople and IP people talk together and drive each other's strategy.

As shown in Figure 2, assuming that the business strategy and the IP strategy are aligned, then the question becomes—what future technology portfolio and IP positions do the firm need five to 10 years down the line? By having a clear understanding of one's own existing IP/technology portfolio and future business strategy, firms can then determine the gaps in their portfolio, which represents their innovation needs.

External Sources of Innovation

In determining how to fill these innovation needs, firms need to look at all possible pathways, employing creativity both in internal and co-operative R&D activities, but also in external technology acquisition, as illustrated in Figure 3. In all these collaborations of whatever kind, IP plays a vital role. Without effective IPM, you will always have a problem after the collaboration regarding who owns what, and who may use which IP that has been generated within the collaboration and for what purpose.

Below are short descriptions of external sources of innovation, including examples, that technology firms can deploy to manage the increased convergence, complexity, and speed required to compete in today's market.

Collaboration with Third Parties

There are many different forms of third-party collaboration. Various options include pre-competitive joint research and collaboration programs, such as the European framework programs; co-creation of new products and services together with other firms; open innovation platforms; and collaborative development together with suppliers and customers. Below are some examples of these different options:

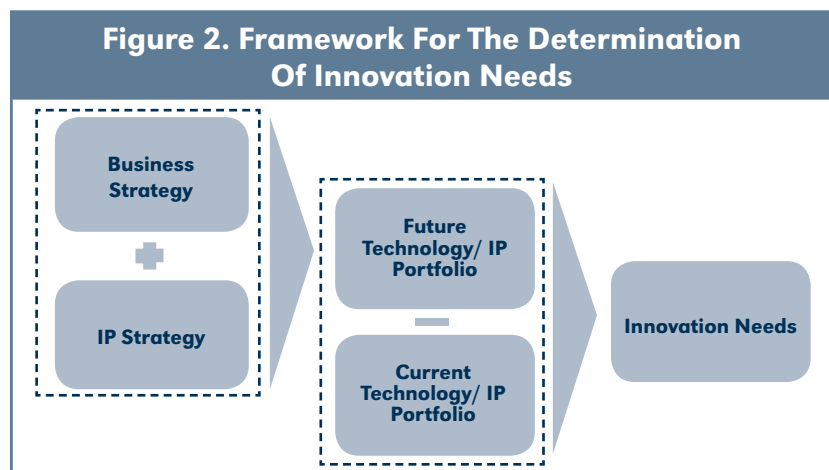
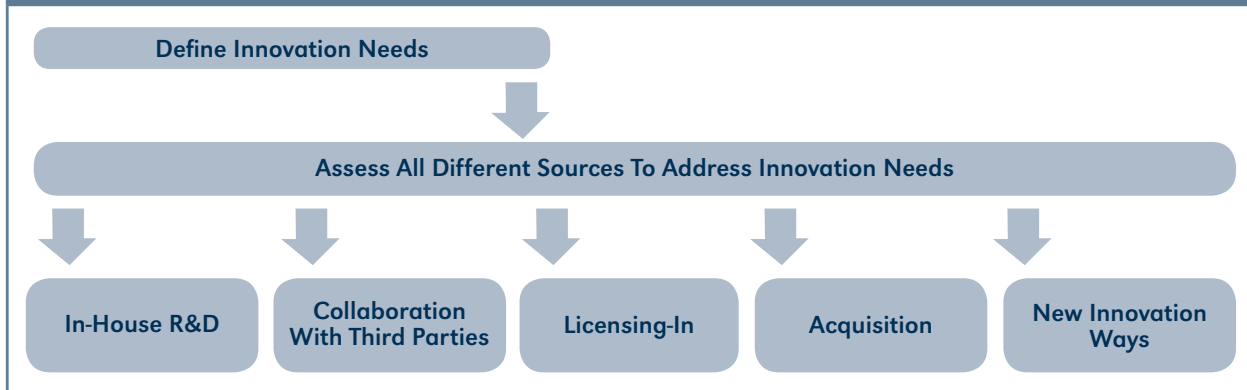


Figure 3. Sources To Address Innovation Needs



- **Co-creation of new products and services**—This is where two or more firms with complementary assets agree to collaborate to create novel products and services. The Senseo coffee machine is an example of one such collaboration between Philips and Sara Lee.¹¹ At the time, it was a completely new concept in the marketplace, focused on coffee making for a smaller number of people instead of the traditional drip filter coffee. The two firms had different corporate cultures as well as different IP cultures that needed to be managed in order to merge the two separate, but complementary, business models required for success. From Philips's side, they had the sale of the coffee-making machines, which is a one-time sale for one-time return. However, from the Sara Lee side, there are the coffee pods that are the consumables that you sell over and over again to create a continuous recurring revenue. Thus, the creation of the new system requires the collaboration of both parties. Still, the different business models need to be considered in order to find a way to share the revenues so that both parties are incentivized to participate. This includes not only sharing the business models but also making alignments to the introduction of these products in the various markets, as ramping up production for coffee machines and coffee pods have different challenges in different markets.
- **Standardization**—This activity is a very traditional but well-known pre-competitive collaboration effort, which has a strong track record of success. Examples include cellular standards such as 3G/4G/5G, Wi-Fi and other connectivity standards.¹² Patents essential to these standards have to be managed properly from both a commercial and risk management perspective. Increased technology convergence and digitalization will mean that IPM will increasingly need to include stand-

ardization strategies as part of their core activities, not only firms in the ICT sector, but firms across all industry sectors, in particular, the various IoT verticals.

- **Supplier-Customer Collaboration**—This activity ranges from joint development to sole development by suppliers on the basis of requirement specifications. The supplier interface is an essential source of innovation; in particular, the use of suppliers in new product development, although there is a risk for customers to be marginalized to the basic role of an assembler of products. This risk can be reduced by gaining control over the supplier through strategic IP positions.
- **European Framework Programs**—This includes programs such as Horizon 2020 (followed by Horizon Europe) or the Innovative Medicine Initiative (IMI), where guidelines regarding the background and foreground IP are set as part of the contractual arrangement of the different parties involved in the collaborative R&D.^{13,14} The Sono Drug is an example of a European collaboration project that Philips did in the past with a number of other research institutes and universities. The project focused on increasing the effectiveness of treatment through targeted delivery of medicine using ultrasonic waves.¹⁵
- **Collaborating with universities and research institutes**—There are various forms of collaboration when working with universities:
 - **Joint Research**—Parties have to set clear rules with respect to the ownership and use of the IP generated during the joint research activities to avoid possible conflicts later on during the commercialization as well as publication of results.
 - **Contract Research**—This is where you give the

11. https://www.usa.philips.com/a-w/about/news/archive/standard/news/press/2012/20120126_SaraLee_partnership.html.

12. For more information on standards development, see <https://www.3gpp.org> and <https://www.ieee.org>.

13. See, for example, <https://www.imi.europa.eu/apply-funding/general-overview/intellectual-property>.

14. Collaboration of Publicly Funded Research Organizations (PROs) with Businesses, https://www.wipo.int/edocs/mdocs/mdocs/en/cdip_17/cdip_17_inf_3.pdf.

15. <https://cordis.europa.eu/project/id/213706/reporting>.

problem to the university and let them work on the issue. In essence, you contract it out, and you hope to get back the research results you need.

- IP/Technology License—This is where a university has developed a specific technology and transfers it to a commercial company that's going to use it. From experience, the main challenge with this model is the different expectations of the parties regarding the value of the technology/IP, especially regarding upfront payments, as opposed to the sharing of risk through downstream royalties for what are often early-stage research results that need significant investments for further development and still bear considerable financial risks for the commercial company.

Licensing-in and Acquisition

Another option to acquire IP/technology is to license-in specific assets or to acquire entire firms. For example, today's major platform firms (*e.g.*, Google, Apple, Microsoft, Amazon and Facebook) make use of strategic acquisitions to get access to crucial IP/technology assets and complementary capabilities required for their future businesses. In essence, they buy their way into the future. They are acquiring innovation options to secure their future sustainability. In particular, when these firms know they're going to enter a particular market where they have no IP portfolio or a limited one, a specific acquisition can be made to bolster their IP portfolios just for defensive purposes, so that in case they are faced with patent assertions and litigations, they can defend themselves. This can complement or support acquisition of special know-how and creative R&D teams to speed up innovation, but this is not always the case.

However, not all firms have as deep pockets as these top platform companies, so they need to strategically acquire IP/technology both effectively and efficiently. Below are several IP/technology acquisition tactics that firms can deploy to address their innovation needs:

- Employ technology scouts based on identified needs
- Build a network of relationships with universities/SMEs active in fields of interest
- Engage the network of IP brokers as intermediaries to facilitate IP identification and transactions
- Seek to acquire or in-license relevant technology/IP early when the price is within a pre-determined range

It should be understood that IP scouting and acquisition is a difficult activity, comparable to panning for gold, where not all shiny objects actually turn out to be valuable. Fundamental questions to consider include:

- Do you know what technology/IP you are buying?
- What is the quality of the technology/IP?
- What is the fair price that you have to pay to enable a win-win outcome?

Especially in the current IP climate, where many patents are challenged when actively used, few companies are willing to spend millions on acquiring patent portfolios just to see their key patents invalidated down the road. So, obtaining quality patents that survive due diligence assessments are core, which needs to be the focus of an advanced IPM process. ■

Available at Social Science Research Network (SSRN):
<https://ssrn.com/abstract=3583024>.