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Finding Applications for Technologies Beyond the Core Business

Only a small number of companies systematically search for opportunities to apply their technology outside their core markets. As a result, many firms miss out on potential profits and avenues for growth and renewal.

By Erwin Danneels and Federico Frattini

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The Leading Question

How can companies target new applications for their technologies?

Findings:

- *Only a small number of companies make deliberate efforts to tap the potential of their technologies beyond core markets.*
- *Companies need a full understanding of what their current technology can do.*
- *Once they identify alternative applications, they can decide whether to develop products themselves or work with partners.*

Your company may be sitting on a hidden treasure. The technologies underlying your core business could have lucrative applications beyond the ones that you provide to your current customers. However, if your company is like others we have studied, you aren't pursuing those opportunities, or you're doing it half heartedly at best.

In recent years, we have researched or consulted to several dozen organizations in the United States and Europe. In doing so, we have frequently identified untapped opportunities where "fungible" technologies might deliver significant benefits to customers in diverse industries.

Companies are often successful at applying technologies to new products for the customers they already serve. But they frequently stumble when they try to leverage their technologies in new markets. Determining how to go about applying one's technologies to different markets isn't obvious. The goal of this article is to help managers find and address applications outside of the businesses for which a technology was originally developed. We call this process "technology leveraging" - applying technological competence to customers the company does not yet serve.¹

Consider Kuka AG, a German producer of industrial robots. At the end of the 1990s, the company began looking for opportunities to apply its robotics technologies outside of manufacturing. The search led to the establishment of a new division aimed at the entertainment and simulation sectors.

In 2010, the company's robots became the core element of Universal Studios Florida's Harry Potter and the Forbidden Journey ride. During the ride, the robotic arms dive, turn, and pivot in synchrony with projected images, giving riders the illusion of extreme movement. The new business gave Kuka, recently purchased by Midea Group of Guangdong, China, a new source of revenue and profits.²

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In our experience, only a small number of companies make a deliberate effort to tap the potential for business outside their core markets. As a result, most companies miss out on potential profits and avenues for growth and renewal. Society also loses because it doesn't get to reap the benefits of technological progress. Through our research and practical expertise, we have developed a process to help companies leverage technology. It relies on four steps:

1. Characterizing the technology
2. Identifying potential applications
3. Choosing from among the identified applications
4. Selecting an entry mode

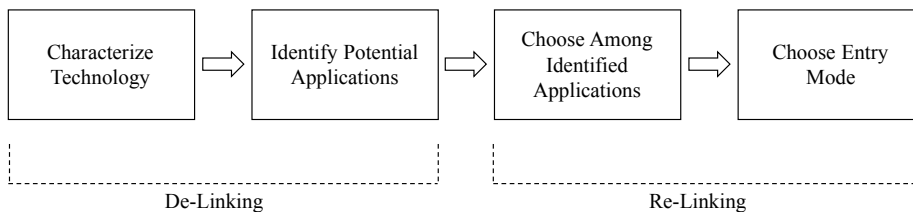


Exhibit: How to Leverage Technology

Caption: Leveraging technology involves 'de-linking' the technology from its current product application and then 're-linking' it to new applications. De-linking starts with understanding the capabilities and the limits of the technology, which then sets the stage for identifying new applications. Re-linking consists of selecting the most attractive markets and then determining whether to serve them with products developed internally or to work with external partners and/or licensees.

Step 1: Characterize the technology

The first step in leveraging technology is to describe the underlying technological competence. The idea is to "de-link" the technology (for example, a robotic arm that can move in multiple directions) from the specific products in which it is currently used. To do this, companies need to identify the functions the technology can perform. This allows managers to explore the technology's fungibility and begin to imagine new applications. A good characterization can broaden the scope of the potential opportunities and allow people to focus clearly on the technology's abilities and limits.

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Bruce says: Resolved?

The process begins with an understanding of the "core functionality" of the technology you are hoping to leverage. Consider the case of Service Network Inc. (SNI), a machine tool manufacturer located in Auburn, Massachusetts. SNI developed a new technology for positioning the heads of its computer numerical control grinding machines, using a set of stacked interlocking gears. In addition to placing the grinding wheel on a plane (along X and Y axes), it also allows for angular motion.

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In its search for non-machine tool applications, the company had to be clear about the technology's core functionality. Management concluded that, at its core, the technology gave users the ability to position objects in space. Once this was established, SNI specified how the technology performed along multiple dimensions (such as force, precision, speed, range, and energy consumption). Based on the set of characteristics, it studied alternative technologies that provided similar functionality and developed a table that compared competing technologies, and the advantages and disadvantages of each. This allowed managers to identify their competitive advantages and see which technologies they could compete with, and which ones were superior.

In many settings, this step requires extensive testing and R&D investment. Indeed, you can't look for new applications until you know what your technology can do vis-à-vis what competing solutions do. For example, Saint-Gobain S.A., a French multinational corporation that produces a variety of construction materials along with advanced materials for use in semiconductor manufacturing, wanted to apply its ceramics technologies to new markets that were less cyclical. However, like SNI, it couldn't start pursuing new markets until it knew what the technology was capable of (for example, the temperatures it could tolerate). Characterizing the technology has to be done before seeking input from the market.

Step 2: Identify potential applications

Once companies have specified what the technology is, they can begin to explore new settings where it might be applied. We have found that market research should consider a broad scope of potential applications, but it should also hew closely to an understanding of the technology's functionality described in Step 1. In searching for new applications, there are a number of things to keep in mind. Although we recommend starting with desk research, the biggest benefits often come from getting out of the office and interacting with people at conferences and trade shows.

Desk research involves searching databases for patents, trade literature, trade conference programs, and general web searches. In searching for new technology applications, it's frequently helpful to study technologies that have the same core functionality and to examine how they are being applied. This will help you identify technologies your own might compete with or substitute for. SNI found, for example, that its positioning technology was unique in that it allowed objects to rotate. Patent searches can help you identify inventions that are similar to yours.

In researching patents, it's important to examine the patents for claims regarding functionality. Rather than using a single set of search terms, it's helpful to search using a variety of words that point to similar functions.

In different industries, different words may be used to convey the same functionality. Consider the experience of SAES Getters S.p.A., an industrial materials company based in Milan, Italy, whose products are used in various industrial and medical applications. In an effort to find new markets for its functional polymers, which absorb gases, managers conducted search queries for competitive technologies using an array of keywords (everything from absorber, absorbent to functional, getter, reactive, scavenger, and inhibitor). The company found that, besides the direct competitors it already knew about, there were other patent holders it didn't know about operating in the chemical, packaging, and printing industries. Management became aware that people in the other industries spoke different languages from the one they used. For example, instead of talking about "getters" (a material technology originally developed for the display market), they tended to use terms such as "fillers," "scavengers," and "desiccants." This awareness enabled managers to refine the search for

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new applications, and later provided the company with input on words to use when communicating about the technology with potential customers.

To learn about possible areas of application, trade publications and broad industry studies can be a good place to start. Which technologies are currently used to serve the functionalities you identified in Step 1? What are the pain points and stumbling blocks where current solutions fall short? However, such research is often just a warm-up for more active engagement. Trade shows provide an excellent way to see first hand where the technology and its alternatives might be applied, and to hear about the pain points of the existing technologies. Indeed, after attending a broad trade show, companies can obtain valuable information by attending more focused, industry-specific trade shows to explore ideas in more detail.

One company we studied, Mario Cotta Zincometal Group S.p.A., also based in Milan, Italy, did just that. One of the world's leading manufacturers of pneumatic knife holders, circular knife blades, and slitting systems, Mario Cotta developed an innovative cutting machine for producing paper tissue. This machine bypasses some phases of the traditional production process, which allows the company to cut lead times and manufacturing costs. Company executives sensed that the technology had possible applications beyond tissues, although it didn't know what the other applications might be. Eager to find new markets, they decided to attend Drupa, a large printing and cutting technology trade show held every four years in Düsseldorf, Germany. Employees from Mario Cotta participated in the 2012 show both actively (with a booth displaying the proprietary technology) and passively (with three people touring the show to scout out new opportunities). Thanks to this effort, the company identified a potential application involving industrial felts. To learn more about this prospect, managers attended a more specialized trade show called Converflex, where it established contacts with potential clients. Whereas Drupa gave management an overview of how the company's cutting machine might work outside its original sector, the specialized trade show provided a more specific set of options.

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In addition to trade shows, some companies have found it productive to reach out to experts both inside and outside the organization for ideas. For instance, in an effort to develop ideas on how to leverage its expertise in ceramics technology, Saint-Gobain several years ago convened a meeting of some of its top scientists and engineers from various divisions and specialties to brainstorm. We have also seen companies tap university researchers and professors to good effect, as many academics don't specialize in particular markets and often have a broad range of contacts.

When looking for new ideas, some companies have found that reaching out to people whose knowledge base is different from theirs can be more productive than working with contacts who have overlapping expertise. A German high-tech company that we worked with, for example, developed an innovative technology for generating electricity from superconductors. The technology was originally created for distributed residential energy generation systems, but the company envisioned that it might work in other settings. To find additional applications, the company invited professors and researchers from several different universities who worked in the energy field to take part in informal meetings and focus groups to brainstorm on new ways to apply the technology. The meetings were moderated by professors from the Italian university where the focus groups were held, who challenged the participants to identify potential applications that made use of the core functions of the technology. In addition to suggesting new applications, some of the attendees shared contact information of people they knew working in related fields.

Yet another path forward is to engage with communities of problem solvers who might be able to offer suggestions for potential applications. Research has shown that many potential problem solvers are motivated by contests such as those hosted on platforms operated by open innovation

and crowdsourcing specialists like InnoCentive or IdeaConnection.³ Fiberstar Inc., for example, a privately-held biotechnology company based in River Falls, Wisconsin, has found that contests can lead to new applications. Fiberstar's most successful invention to date is a natural citrus fiber derived from citrus pulp, a byproduct of orange-juice production. Most of the applications for citrus fiber have come from students who participate in the company's global contests. One of them, developed by students from the Oregon State University, has shown the feasibility of using citrus fiber to reduce the oil content in fried seafood and other fried food.

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Step 3: Select from among the identified applications

Once companies have de-linked their technology from its original product applications, they can begin to re-link them to new markets. Thus, the next step is determining which potential applications to pursue. Although selecting opportunities with the most promise may appear to be straightforward, in practice it can be more involved. First, you need to assess the requirements of the new applications to make sure the technology is up to the task. In many cases, the technology needs to be adjusted, which often takes both time and money.

Based on our experience, simulation studies can be helpful, but they may not be enough. They often underestimate the problems that will arise when actually applying the technology, which may only be revealed by building early prototypes. Moreover, prototypes are more effective at making the value of the technology tangible to prospective customers.

Consider the case of a U.S. company that manufactures components for controlling sealing in automotive applications, such as engine valves. As the company searched for new applications for its technology, it conducted simulations in which the technology was used in medical settings. Two potentially promising medical applications were seals for blood bags and catheters. Unfortunately, the simulations didn't pick up on a critical difference between what the sealant does in the automotive setting and how it needed to work in bio-medical applications. In automotive applications, the sealant has to be rigid because the components it joins together don't change during operation; in bio-medical settings, it has to be elastic because the sealant has to adapt to the changing shape of the components. This difference didn't become obvious until the company began making prototypes.

When considering new applications for new markets, it's critical for managers to study the technologies that are currently being used in the new markets and to fully understand their pros and cons. In what ways does your technology perform better than the current approach? How is it worse? Is it possible to develop a value proposition that makes the product using your technology superior, either in the value it provides or based on cost?

In bringing your technology to new markets, the goal should be to find new application areas where your technology is superior. However, superiority can take several forms: better performance on existing performance dimensions; introducing a new performance dimension; or delivering the desired outcome at a lower cost. Often, it's a combination of factors. SNI, the machine tool company discussed earlier, found that it was able to build its product at a competitive cost, and based on its design it was also less expensive for users to operate it.

An Italian company we have worked with that specializes in protective packaging solutions for businesses and consumers, uses three criteria to evaluate and prioritize new applications for its proprietary technology: 1.) technical feasibility: the extent to which the technology can be adapted to the identified application; 2.) market attractiveness: the potential economic value; and 3.)

innovativeness: the extent to which the technology is novel in comparison with the technologies currently used in the targeted sector. Management ranks potential applications along these criteria using a weighted scoring method.⁴

Sometimes the decision to pursue an alternative application is complicated by the certification and regulatory process the focal technology has to go through. For example, a U.S. company we know explored the possibilities of using its advanced metal composites to produce cardiac pumps. However, it reconsidered when it learned about the challenges of certification and approval by medical authorities.

Step 4: Choose the best entry mode

The fourth and final step in leveraging technology involves determining the best way to develop and commercialize the products that use the technology. In bringing technology to market, companies need to decide whether to develop products themselves or work with a third party. This decision can have significant implications in terms of capital requirements, time to market, level of control, and required commitment.⁵ However, there are no universal guidelines that apply in every situation.

In assessing the relative benefits of one approach versus another, managers should begin with an understanding of their organization's existing resources and capabilities. For example, does the company have the manufacturing facilities and know-how to make the product? If yes, it may make sense to commercialize the technology internally.⁶

To the extent that you will be attempting to enter a previously-unserved market, you will also need to know if the company has the necessary resources to serve the new market. If not, you will need to either develop or access a new set of market-related resources, including a new distribution channel and a clear sense of how to meet customer needs.⁷ In our experience, developing new market-related resources (such as the customer relationships for a new industry) can be difficult.

The fact is that many companies that are able to develop technology don't have the skills and resources to commercialize their technologies to succeed in new markets. That's why some companies need to find application-development partners who have the necessary resources, be they manufacturing know-how, distribution capability, or brand equity. SAES Getters, the Italian industrial materials company, for example, decided that the best way to apply its industrial materials technology to food packaging was to collaborate on research with a small Italian company named Metalvuoto S.p.A., which specialized in developing plastic films for preserving food. Eventually, it acquired the company.

Still another option is to license the core technology (as opposed to a fully developed application) to another organization. This involves commercializing the company's technology through out-licensing agreements to other manufacturers, although it can also involve selling patents or spinning out the entire business unit that focuses on the new technology. Licensing offers an effective vehicle for converting proprietary technology into a more general technology platform. ECI Biotech, a Worcester, Massachusetts-based company that specialized in sensors for detecting microbial pathogens provides a good example. Its technology appeared to have relevance to multiple areas, including wound care and food safety. With this in mind, the company established partnerships and exclusive licenses with several large companies, including Johnson & Johnson, giving them rights to apply the technology to specifically delineated products. The partners, in turn, were required to

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Bruce says: Resolved.

Commented [ED12]: It is not about developing a new application, it is about accessing a new market.

Bruce says: Resolved

Commented [ED13]: This is an absolutely critical point. Is is about the difference between R&D competence and Marketing competence, which I have published about extensively.

Bruce says: OK? Resolved?

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Facebook is not a very good source! Can we find another?

Well, I meant it has all the links to other sources.

I can't for sure say it went under in 2011, but that is when the FB updates stop, and there is an article that says a major loan was declined.
<http://www.telegram.com/article/20110908/news/109089442>

provide additional development funding for their specific applications, and they had an option period during which they could either develop the commercial product or terminate the agreement.

In many cases, a big challenge is establishing the value of the technology—it's easy to undervalue it and charge a royalty fee that does not adequately capture the value it provides its new user. We saw this happen with a leading manufacturer of anti-vibration systems for heavy trucks and industrial vehicles. The company licensed its technology for use on light trucks. However, management was not familiar with the new market and agreed to a royalty fee that was low relative to the value the technology created. Indeed, licensees tend to know more than licensors about the value a particular technology can bring to specific applications (which often puts licensors at a disadvantage).

Although companies aren't always aware of it, the technologies they use in their core businesses often have more than one application. Unless managers take steps to figure out what the additional applications are, they risk leaving money on the table. Yet tapping into new opportunities can often be complicated. First, it requires companies to free themselves from the pull of their current customers and think more broadly.⁸ Seeking out new markets is a skill in and of itself — one quite different from serving current customers.

In many cases, it also requires a leap of faith. Because it is difficult to judge *ex ante* whether conducting a leveraging project will be worth it, many companies resist committing the resources to explore opportunities in a serious way. However, the reality is that projects aimed at leveraging technology will always have to compete with the company's mainstream businesses for resources. In our experience, companies that achieve the most success in leveraging their technologies commit themselves to multi-year budgets for technology leverage and make technology leveraging part of their strategy.

For many companies, the untapped potential of underutilized technologies can mean lost opportunities—missed growth and profits. For society in general, it can mean jobs that aren't created and products that aren't developed. These are treasures we think are worth hunting for.

About the Research

Our framework is based on our experience in advising companies on technology leverage, discussions with practitioners, and scholarly research on the topic. In the past decade, we have advised more than 20 companies and participated in 25 technology leverage projects. Based on these engagements, we developed insights into the processes and approaches that are conducive to successful technology leverage. In addition, we have discussed technology leveraging with more than 40 R&D, licensing, and intellectual property managers, chief technology officers, and consultants. We have also collaborated with BlueThink (www.bluthink.company/home.php), a consulting firm based in Milan, Italy, that specializes in technology transfer and technology leverage. Our discussions have helped to corroborate the framework in this article, which builds on our academic and published studies on technology leverage in several academic journals.

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