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“There is a deeper logic to building portfolios than simply leveraging competencies.”
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Is Your Innovation Process Global?

Many companies have supply chains that are global. Starting with the sourcing of components and raw materials from around the world, they then move their basic manufacturing to low-cost locations overseas. An increasing number of companies also have begun to transfer their support services and customer call centers to cheaper sites. But few of them have innovation processes that are equally global.

It's true that many companies have research centers or product-development teams scattered around the world. But more often that not, each of those units is focused on leveraging the knowledge available at its doorstep. Even so-called "centers of excellence" tend to be dominated by the thinking and technologies available in the countries where they are located. Rarely do innovation activities integrate distinctive knowledge from around the world as effectively as global supply chains integrate far-flung sources of raw materials, labor, components and services. Moreover, the units responsible for innovation in most companies are often poorly equipped to cut costs by accessing knowledge from nontraditional, cheaper locations.

But some companies have managed to assemble an integrated "innovation chain" that is truly global, allowing them to outflank competitors that innovate using knowledge in a single cluster. They have been able to implement a process for innovating that transcends local clusters and national boundaries, becoming what we dub "metanational innovators." This strategy of utilizing localized pockets of technology, market intelligence and capabilities has provided a powerful new source of competitive advantage: more, higher-value innovation at lower cost. It is the logical next step beyond augmenting in-house R&D with external ideas in what has been called the "era of open innovation."²

The Strategic Advantages

To appreciate the far-reaching advantages of metanational innovation, consider the battle between Motorola Inc. and Nokia Corp. in the cellular phone industry. Motorola was a pioneer in the technology, building on initial pathbreaking research from Bell Laboratories. By

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By sourcing and integrating knowledge from dispersed geographic locations, companies can generate more innovations of higher value and lower cost.

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deploying U.S. knowledge to match the needs of U.S. customers, the company came up with a string of incremental innovations, all based on the initial analog technology. But an insular innovation process prevented Motorola from foreseeing the market shift toward digital mobile technology and the global system for mobile (GSM) communication, which became the standard in Europe. The company also missed the opportunity for making cell phones fashionable and appealing to trendy consumers. And Motorola was slow to understand the new ways that mobiles were being used, thus failing to recognize that a broader, fragmented customer base would spell the end of one-size-fits-all products.

In contrast, newcomer Nokia was an early metanational innovator. By researching customers in Europe, where different segments of users first began to emerge, the company was a leader in recognizing that digital technology could dramatically improve the functionality of mobile phones, paving the way for customized handsets. And after observing trendy customers in Asia, engineer and design its airplanes, Airbus takes advantage of diverse sources of expertise — including wing aerodynamics from the United Kingdom, avionics from France and flight-control technology from the United States — all combined with knowledge of the different needs of carriers from other countries serving different regional markets.

Computer Associates International Inc., a leading player in software and related services, has been losing ground in the global market to SAP AG, a German company. In addition to harnessing hardware and software technologies from around the world, SAP’s innovation process has leveraged market knowledge drawn from a far-flung group of early foreign customers, such as U.K.-based Imperial Chemical Industries Plc and Deere & Co. in the United States. This knowledge has enabled SAP to develop products to handle national differences in language, currency and accounting conventions, satisfying the need for cross-border integration of data and enabling this information to be accessed and analyzed easily throughout a corporation.

In the fast-food industry, earlier difficulties at McDonald’s Corp. might be attributed in part to the company’s narrow innovation process, which was rooted deeply in the United States even as the company’s operations spread across the globe. Contrast that with Starbucks Corp., which has combined diverse pools of knowledge — including Italian technology for espresso coffee roasting; the European concept of the café; and U.S. expertise in retail chains, fast-food service routines, logistics, and staff training and incentive systems — to reinvent the selling of cups of coffee in the United States.

For companies such as Nokia, Airbus, SAP and Starbucks, metanational innovation is much more than just a means to develop some new product or service. It has also enabled firms to develop valuable business models, strategies and capabilities that their rivals have found difficult to emulate. In other words, for some companies, metanational innovation has become a decisive source of competitive advantage.

Of course, it is still possible for some companies to succeed by confining innovation to their home country or even by focusing on a single cluster of knowledge. Intel Corp. is a case in point. The company has managed to win a dominant share of the global market for standard semiconductors — first in memory chips and then in microprocessors — by relying primarily on the pool of knowledge located in California’s Silicon Valley. Its strategy of innovating locally and then delivering the resulting products efficiently through a global supply chain has clear attractions. For one thing, coordination of the innovation process is greatly simplified when the necessary knowledge is available mainly in the heads of people who share the same language and understanding of local context — everything from implicit roles and responsibilities to accepted development cycles.
But even Intel has begun to deploy more knowledge from overseas. Some of its wafer-lithography technology, for example, has come from Japan, while a significant source of innovation for the company is now obtained from Israel. And Intel has been casting a wider net. Today its corporate-venturing fund has investments in more than 20 countries, allowing it access to new technologies from around the world. In that respect, Intel's mind-set is drawing nearer to that of global innovators such as the European chip company STMicroelectronics Group. (See "STMicroelectronics and Metanational Innovation," p. 34.)

Harnessing the Potential of Diversity

Innovation typically arises from combining existing technologies and expertise in new ways. New online banking products emerged, for example, from the confluence of separate streams of knowledge about financial instruments, tax codes, IT and communications technologies, and electronic security systems. But combining technological knowledge in novel ways does not necessarily lead to successful business innovations. Companies also need market insight. The supersonic Concorde, for instance, was a remarkable technological feat, but it was also a commercial flop that displayed an embarrassing lack of understanding of customer needs and the competitive dynamics of the market.

Thus, companies can greatly improve their flow of innovation by assembling the best combinations of technical know-how and market expertise, and they can enhance that process substantially by looking far and wide for that knowledge, rather than relying solely on local sources. Just as the overall performance of a hi-fi system is limited by the quality of its weakest component (often the loudspeakers), the probability of successful innovation will be constrained by the weakest source of knowledge. In other words, the probability of a successful innovation emerging from a group of people churning through the same existing cluster of knowledge is far less likely than that of the innovation being sparked when pieces of knowledge from diverse sources interact.

Accessing sufficient diversity of knowledge is therefore a key challenge, and that capability becomes crucial as a market matures and a company strives to differentiate itself. After all, if a company fishes from the same knowledge pool as its competitors, the result is likely to be uninspired "me too" products. The evolving market for personal digital assistants (PDAs), for example, has forced palmOne Inc. and other manufacturers to draw on increasingly diverse types of knowledge, including that for wireless communications and phone ergonomics. Similarly, as companies attempt to offer complete solutions instead of stand-alone products and services, they need to obtain a better understanding of the myriad, subtle and often unarticulated needs of customers.

Geographic Lodes of Knowledge

The relationship between geography and knowledge diversity is important but not always immediately evident. In Finland, for example, the high cost of installing and maintaining fixed telephone lines in isolated places (combined with the country's harsh winters and low population density) has spurred advances in radio telephony. In Germany, cultural and political factors have spurred the growth of a strong "green movement," which has led to an accumulation of distinctive market and technical knowledge in recycling and renewable energy. In Japan, the high cost of land has forced companies to become experts in just-in-time production systems for minimizing inventory.

Globalizing the innovation process is an important way to access this great diversity of knowledge. Often, globalization is not only desirable but essential. Years ago when the locus of critical knowledge in the computer industry began to shift from the Route 128 corridor near Boston to Silicon Valley, a number of East Coast companies (Wang Laboratories, Digital Equipment and Data General, among others) failed to make the necessary adjustments and suffered serious consequences. Today that same imperative to harness new pockets of geographically distant knowledge is happening on a global scale.

Take, for example, the pharmaceutical industry. Companies such as Novartis AG and GlaxoSmithKline Plc now realize that the knowledge they require extends far beyond traditional chemistry and therapeutics to include biotechnology and genetics, and the use of advanced computers and robots in drug discovery. Much of this new knowledge has emerged from diverse sources away from the companies' traditional R&D labs in Basel, Bristol or New Jersey. Instead, it is often located far away in California, Tel Aviv, Cuba or Singapore. As a result, these pharmaceutical giants have learned that globalization of their innovation processes is no longer optional; it has become imperative.

Interestingly, the increasing dispersion of knowledge now occurring in a number of industries is partly a logical outcome of
the globalization of supply chains. Specifically, as companies increase their use of contract manufacturing, the sources of new knowledge that flow from improvements to production processes have also become more dispersed. Today, for example, about 60% of all notebook computers are made in Taiwan, making the country a likely source of new knowledge about the manufacture, engineering and design of those products.

Likewise, as multinational corporations transfer knowledge to new locations through their subsidiaries, new pools of competencies will develop at these dispersed sites. When Hewlett-Packard Co., headquartered in Silicon Valley, moved its process-engineering skills to Singapore to manufacture calculators, for example, the company set off a chain of events: The engineers there began to alter the calculator designs, gradually building competencies that were then applied to keyboards and eventually to the complete design of inkjet printers. A new pocket of competency was thus born on the other side of the world.

Companies should also remember that technological breakthroughs can have a large element of serendipity, and sometimes important advances will occur outside the locations with the most resources. In early 1997, for example, researchers stunned the world with Dolly, a cloned lamb. The site of that landmark development? Edinburgh, Scotland — hardly the obvious place for such a breakthrough in genetic engineering.

**Reducing Costs**

Companies that globalize their supply chains by accessing raw materials, components or services from around the world are typically able to reduce the overall costs of their operations. Similarly, one benefit of metanational innovation is cost reduction, albeit to a lesser extent. (That is, the main advantage is that the process will lead to a greater number of innovations of higher value; cost reduction is a secondary benefit.)

Even if knowledge from overseas is similar to that available closer to home, the cost of utilizing the distant knowledge might still be cheaper. Consider, for example, the way that companies are now leveraging software programmers in Bangalore, India; aerospace technologists in Russia; or chip-set designers in China to cut the costs of their innovation processes.

In most cases, though, companies can’t simply relocate their innovation activities lock, stock and barrel to a lower-cost location, because such sites typically lack the full complement of necessary knowledge. Instead, firms usually have to move the lower-cost knowledge (through transmission over the Internet, relocation of
Valuable knowledge can often come from the periphery of an organization, where very different environments tend to encourage diverse skills and capabilities.

Key people or some other means) and integrate it with complementary knowledge elsewhere. Historically, the cost of knowledge transfer was often prohibitive, but improved IT and communications technologies as well as the decreased costs of air travel have recently made such efforts much more economically feasible.

Tapping Into the Benefits
To reap the benefits of metanational innovation, companies must do three things: prospect (find the relevant pockets of knowledge from around the world), assess (decide on the optimal “footprint” for a particular innovation) and mobilize (use cost-effective mechanisms to move distant knowledge without degrading it).

Prospecting Finding valuable new pockets of knowledge to fuel innovation is somewhat like prospecting for gold. The process involves knowing what to look for, where to look for it and how to tap into a promising source.

Consider the efforts of the cosmetics maker Shiseido Co. Ltd. in entering the market for fragrance products. Based in Japan, a country with a very limited tradition of perfume use, Shiseido was initially unsure of the precise knowledge it needed to enter the fragrance business. But the company did know where to look for it. So it bought two exclusive beauty boutique chains in Paris, mainly as a way to experience, firsthand, the personal-care demands of the most sophisticated customers of such products. It also hired the marketing manager of Yves Saint Laurent Parfums and built a plant in Gien, a town located in the French perfume “cluster.” France’s leadership in that industry made the where fairly obvious to Shiseido. The how had also become painfully clear because the company had previously flopped in its efforts to develop perfumes in Japan. Those failures convinced Shiseido executives that, to access such complex knowledge — deeply rooted in local culture and combining customer information, aesthetics and technology — the company had to immerse itself in the French environment and learn by doing. Having figured out the where and how, Shiseido would gradually learn what knowledge it needed to succeed in the perfume business.

An important point about Shiseido is that the company prospected for new knowledge in a systematic and focused way. Sometimes, though, the opportunity to harness distinctive knowledge from a new location is discovered by accident — for example, by the CEO during a vacation abroad — so senior executives should constantly be on the lookout for unexpected sources of knowledge. That said, a concerted campaign of knowledge prospecting can greatly improve the chances of success.

Take the case of the Timken Co., a world leader in roller bearings. The company launched a specific initiative designed to improve its prospecting capabilities. A key element was to establish a small team led by a seasoned executive to play the role of roving reporters, charged with identifying and assessing pockets of emerging technologies or new customer applications, and building a network of contacts to keep the company informed about new knowledge that might help fuel its innovation. Other companies, such as Intel, have used their corporate venture fund or links with the venture-capital community to intercept promising new technologies emerging around the world. Furthermore, establishing a carefully planned network of alliances with lead customers, suppliers, universities, research institutes and even competitors in various parts of the world can be an invaluable aid in prospecting for new market knowledge or technical know-how. And even one relationship in virgin territory can act as a gateway to an entire cluster of knowledge sources. By establishing a link with the State Research Institute of Aviation Systems in Moscow, for example, the French manufacturer Snecma Group gained privileged access to the entire ex-Soviet rocket-science establishment.

For prospecting to be effective, companies must keep an open mind as to where new knowledge might be found. In most organizations, knowledge about markets and technologies drawn from the corporate headquarters or from the largest and most profitable subsidiaries tends to carry the greatest weight in the innovation process. But valuable knowledge can often come from the periphery of an organization, where very different environments tend to encourage diverse skills and capabilities. For example, how many corporations would think of turning to their operations in São Paulo, Brazil, for best practices in Internet banking? Yet a culmination of local factors — including a history of hyperinflation (which made it essential for financial transactions to be settled as quickly as possible), security concerns associated with cash and concentration of the market in the hands of a few large banks — has propelled Brazil to the forefront of that field.

Assessing Of course, incorporating any new knowledge into an innovation process will incur additional costs — especially if it must be accessed from a faraway location. Thus, companies must
The optimum strategy for transferring knowledge depends on the complexity of both market knowledge (low versus high) and technological knowledge (low versus high).

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High

Move information about the technology to where the market knowledge is

Move knowledge by rotating people and by temporary co-location

Low

Exchange information (arm's length, digital transfer is sufficient)

Move information about the market to where the technology is
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The complexity of market knowledge and the complexity of technological knowledge determine the optimal footprint (that is, the number and dispersion of knowledge sources) for their innovation processes. If a semiconductor manufacturer is developing a new chip set for mobile phones, for example, should it access technical and market knowledge from Silicon Valley, Austin, Hinschu, Seoul, Bangalore, Haifa, Helsinki and Grenoble? Or should it restrict itself to just some of those sites?

Determining the best footprint for innovation isn't fundamentally different from the trade-offs companies face in optimizing their global supply chains: Adding a new source might reduce the price or improve the quality of a required component, but more locations also may mean additional complexity and cost. Likewise, every time a company adds a source of knowledge into the innovation process it might improve its chances of developing a novel product, but it also increases costs. So, in theory, deciding on the right footprint is straightforward: Continue adding locations with promising pockets of knowledge until the benefits of extra diversity are outweighed by the increased costs of integration. In reality, though, the situation is far more complicated because the diversity, innovation and cost relationships are imprecise, requiring the weighing of various factors.

First, companies must determine which locations might be absolutely necessary to obtain the required complementarity of knowledge. With flat-screen displays, for example, only manufacturers that combined Western base technology with East Asian process know-how succeeded. Second, the more radical the desired innovation, the larger the necessary footprint is likely to be. Third, a company’s strategy will affect its footprint size. Nokia’s current emphasis on new-application development and market creation, for instance, calls for a farther-flung footprint than the company’s earlier focus on excellence in hardware. Fourth, history is important. General Motors Corp. is currently in a good position to become a metanational innovator because of its past acquisitions (starting in the 1920s with Opel in Germany and Vauxhall in Britain), greenfield investments in countries like Brazil and alliances in Japan and South Korea. Fifth, using the knowledge accumulated within an existing operation is usually easier than adding a site, even though the new ways that the existing location might contribute are sometimes not obvious. Hewlett-Packard, for example, has had manufacturing operations in Singapore since the 1970s, and through that experience the company has gained much expertise in designing products for ease of production and low maintenance. Even so, it took sustained efforts by a series of entrepreneurial managers there to convince the parent company that Singapore should play a central role in new-product development. Finally, the right footprint might evolve as the innovation process unfolds. For incremental innovations, companies are likely to have an initial good understanding of the knowledge bundle required (and hence the optimal footprint). For breakthroughs, though, the footprint might change as the precise definition of the innovation becomes clearer and the company learns from exploring new territory.

**Mobilizing** The real benefits of global innovation occur when bits of knowledge from different sources interact over time in a virtual melting pot from which new products or technologies can emerge. To achieve this, companies must overcome two challenges. First, they have to relocate and bring together those pieces of knowledge that are scattered around the world. Second, they have to provide a suitable organizational form to promote their innovation efforts.

Relocating certain types of knowledge is relatively easy. Technical blueprints or patents are a case in point: The knowledge they represent has been highly codified in a language that enables the message to be readily and unambiguously transferred to engineers or scientists with similar training, even if they are working in another corner of the world. Other types of knowledge are easily relocated because they are embodied in machinery or equipment that can be physically transported. In the terminology of knowledge management, these types of knowledge are labeled “simple” because they can be transferred with relative ease.

But much of the knowledge that has the greatest potential for innovation has characteristics that make relocation difficult, especially when the recipients don’t understand the local context in which the knowledge was generated. Imagine asking a Japanese car designer sitting in Nagoya to develop a novel vehicle that would be fun to drive on a German autobahn in the winter at speeds up to 150 miles per hour. The designer could be given copious information, including competitor data, reports detailing the behavior of German car buyers and technical specs on alternative components from transmissions to braking systems.
Companies need an organizational form ("magnet") for promoting their global innovation initiatives. Sometimes the best magnet is a leading customer. Other times, the product platform.

But would the transfer of all that information result in a winning vehicle? Probably not, because the designer would still lack key elements of knowledge, such as how it actually feels to be driving on a snow-covered road at high speeds for considerable distances. Even the experience of a test track in Nagoya with simulated snow wouldn’t come close to achieving a real appreciation of how different technologies might perform on the autobahn in winter with German traffic. This kind of tacit, context-dependent knowledge is referred to as "complex."

Most innovation projects require a combination of both simple and complex knowledge. To succeed, then, metanational innovation typically requires a mix of mobilization strategies. One approach distinguishes between the type (simple versus complex) and the nature (technical versus market) of the knowledge involved. (See "Mobilizing Knowledge.")

If both the required technology and market understanding score low on the complexity scale, the necessary knowledge can be mobilized by using IT and digital communications tools, allowing the various locations to interact at arm’s length. (See the lower-left quadrant of "Mobilizing Knowledge.") But when the required market knowledge is complex and the technical expertise is readily codified, it makes sense to locate the innovation team near the key market knowledge (where people can experience the local context firsthand) and transfer the technological knowledge there (upper-left quadrant). By contrast, when the technological knowledge is complex and requires spontaneous, close interaction with suppliers, universities and other partners — but the market knowledge is represented through data and research reports — the innovation team should spend most of its time working in the clusters where the technology originates (lower-right quadrant). Finally, when both the technological and market knowledge are complex, one solution is to continually move people throughout the different sites (upper-right quadrant).

In addition to a mobilization strategy, companies need an organizational form (referred to as a "magnet") for promoting their global innovation initiatives. Sometimes the best magnet is a leading customer. (See "STMicroelectronics and Metanational Innovation," p. 34.) Other times, the product platform is a better alternative. With Airbus, the architecture of the company’s aircraft attracts and brings together knowledge from various engineering teams, customers and suppliers from around the world. Using a product platform as a magnet has one advantage: The exact pieces of knowledge required (and the ways in which they fit together) are defined more tightly, which helps pave the way for a more predictable innovation process. We have found, however, that breakthroughs are more likely to emerge when a lead customer acts as the magnet, because platform architectures usually impose limits on the extent of innovation.

A New Imperative

Many corporations are recognizing that the knowledge necessary to come up with valuable innovations is neither in-house nor nearby. And as companies gain more experience with managing new organizational forms, such as virtual teams, globalizing the innovation process is becoming an increasingly practical option. Although metanational innovation has lagged behind the efforts of companies to globalize their supply chains, the competitive advantages gained have been no less impressive. By harnessing the diversity of relevant knowledge scattered around the world, metanational innovators have been able to generate more innovation of higher value and lower cost.

Interestingly, metanational innovators tend to view diversity as an opportunity, not as a problem. And they continually ask themselves questions along the lines of "What distinctive useful knowledge do I see in this local cluster?" and "How can this piece of knowledge contribute to our global innovation effort?" Indeed, globalization is a tremendous undertaking, requiring not just a change in process but also a dramatically new mind-set. That said, as companies like Airbus and STMicroelectronics have discovered, the benefits of increased innovation at lower costs can become a powerful source of competitive advantage.

REFERENCES

1. For more on this subject, see Y. Doz, J. Santos and P. Williamson, "From Global to Metanational: How Companies Win in the Knowledge Economy" (Boston: Harvard Business School Press, 2001); and the Web site www.metanational.net.

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