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The next frontier of **innovation**

Some companies are learning how to take a more creative approach to mobilizing resources.

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Ever since 1911, when Frederick Winslow Taylor published *The Principles of Scientific Management*, businesses have pursued efficiency with a focus that borders on obsession. Nearly a century later, CEOs and management authors are still writing hymns of praise to the benefits of executing operations more efficiently than the competition does. This fixation has yielded some highly precise approaches to managing modern institutions and technology. Although these practices vary in their details, they share a common foundation: pushing resources into the areas of greatest anticipated need. In today's business world, highly automated factories or service platforms, supported by rigid and standardized processes, deliver resources to the right places at predetermined times. In information technology, massive enterprise applications specify activities to be performed and resources to be deployed to meet anticipated demand. In education, standard curricula expose students to codified information through a predetermined sequence of experiences—an approach many corporations follow in their employee training.

In each of these examples—and in "push" systems generally—the core assumptions are that companies and other institutions can anticipate demand and that mobilizing scarce resources in previously specified ways is the most efficient and reliable way to meet it. But the efficiency of push

Article at a glance

Most companies now mobilize resources by deploying push systems, in the mistaken belief that they promote efficiency.

Push systems—characterized by top-down, centralized, and rigid programs of previously specified tasks and behavior—hinder participation in the distributed networks that are now indispensable to competitive advantage.

More versatile and far-reaching pull systems—characterized by modularly designed, decentralized platforms connecting a diverse array of participants—are now starting to emerge in a variety of arenas.

As pull systems reach center stage, executives will have to reassess almost all aspects of the corporation.

systems comes at a stiff price, for they require companies to specify, monitor, and enforce detailed activities and tasks. This rigidity necessarily restricts the number and diversity of the participants in push models, thus limiting the innovation and learning that can take place in them. It also tends to turn workers into mere instruments of management at a time when self-directed effort from a broad range of employees is ever more essential to big corporations (see "The 21st-century organization," in the current issue).

The highly specified, centralized, and restrictive nature of push systems prevents companies from experimenting, improvising, and learning as quickly as they might, both throughout their own organizations and across others. Push systems not only inhibit product innovation but—even more important—make it much harder to implement incremental process innovations rapidly. In a world where the relative pace and trajectory of capability building are of constantly rising importance,[1] push systems thus hinder companies from participating in the distributed resource networks that are now indispensable to competitive advantage. The next frontier of innovation will require the broader adoption of pull capabilities as well as less reliance on traditional push systems, which, as demand becomes more and more difficult to forecast, increasingly fail to deliver even the efficiency they were designed to promote. Organizations that use them either pile up inventories or go through costly somersaults in an effort to keep up with unanticipated market shifts.

Signs of a new approach

Many companies continue to operate on the flawed assumption that demand is intrinsically foreseeable. But others are beginning to embrace a more flexible approach to setting in motion (or *mobilizing*) tangible and intangible assets (or *resources*), which may reside within or outside the company. This new approach might be called the "pull" system of resource mobilization. Its early elements began to emerge from Toyota Motor's lean-manufacturing

[1] John Seely Brown and John Hagel III, *The Only Sustainable Edge: Why Business Strategy Depends on Productive Friction and Dynamic Specialization*, Boston: Harvard Business School Press, 2005.

system in the 1950s, when the company began pulling resources into the assembly line as needed rather than allowing inventories to pile up during production. But more versatile and far-reaching pull systems—which extend beyond production and, indeed, beyond the enterprise itself—are now beginning to emerge not just in manufacturing and supply chain operations but also in arenas as diverse as pharmaceutical R&D and the media. These early pull models, driven by changing strategic and operational needs and facilitated by the Internet, are visible primarily at the periphery of more mature push models. Often, as in education, they are emerging under the radar, in unexpected areas.

These systems have far-reaching implications for the way companies organize and manage their activities.

How pull systems work in one industry

Over the past decade, the mass media have been transformed by the digitization of content (text, voice, and video) and by new ways for customers to access, assemble, and distribute it through the Internet. Rather than waiting for media companies to push out their content, for instance, their customers increasingly pull it in at will. New media distribution businesses are breaking down the traditional channels' shelf space constraints, radically expanding the range of content available, and providing robust tools to help users search for it. Sometimes these businesses, such as Amazon.com and Netflix, resemble conventional retailers in the sense of providing a single point of access to a broad assortment of media. Some provide new ways to sample media before the purchase (for instance, the TouchTunes Rhapsody digital jukebox for music). But others lack any central hub and instead help owners of content interact with each other directly. Half.com (now owned by eBay) is analogous to a local flea market. Peer-to-peer networks such as BitTorrent let participants download movies, music, and other digital media.

In the media business, pull approaches have transformed more than just distribution channels. On the production side, a vibrant "remix" culture has emerged thanks to the availability of widely affordable digital audio-editing tools, which make it possible for DJs in nightclubs and other music fans to pull in tracks from a variety of music sources and to recombine them. "Blogging" tools help users "publish" their own writings, music, or photographs, most often by pulling in content from a broad range of sources and creatively mixing and commenting on it.

Global process networks

Skeptics might argue that the media business is unique and that its emerging pull systems have little application to sectors whose products are harder

to digitize. Yet pull approaches to the mobilization of resources are also taking hold in product businesses, particularly in categories characterized by compressed life cycles and rapidly evolving customer demand.

Consider the three core operating processes of a business: managing supply chains (including manufacturing and logistics), creating and commercializing products, and managing customer relationships. In industries as diverse as apparel, computers, and motorcycles, new approaches to the mobilization of resources—what we call global process networks—are emerging to organize these three processes across hundreds, and often thousands, of enterprises. Such global process networks, which change size and shape depending on the challenge in question, use significant features of the pull model. Participating companies operate across traditional corporate boundaries, collaborate on innovative solutions, and learn from one another in a way that helps them speed up the building of capabilities.

Supply chain management and manufacturing. Li & Fung, a Hong Kong–based apparel producer and distributor that works with 7,500 business partners, in 37 countries, can call on any number of specialists to manufacture everything from high-end wool sweaters to synthetic slacks. The company, one of the new model's most sophisticated practitioners, has rewritten the rules of supply chain management. Traditional supply chain managers focus on limiting the number of partners and on creating tightly integrated operations—the Wal-Mart approach. Orchestrators like Li & Fung are rapidly expanding the range of participants in order to gain access to more specialized skills, as well as nurturing and developing relationships that help all parties build their capabilities more quickly. Li & Fung sits at the hub of a network of specialist enterprises that pull in resources in different combinations and configurations, depending on the nature of demand.

Product innovation. Taiwan's original-design manufacturers, such as Compal and Quanta Computer, offer equally compelling examples of distributed product innovation. These ODMs creatively pull together highly specialized component and subsystem suppliers in order to generate ideas for delivering higher performance at lower cost in a broad range of digital devices, including digital still cameras, mobile telephones, and notebook computers. Instead of designing products in detail from the top down, ODMs specify ambitious performance targets and then rely on this diverse network of technology partners to find new ways of meeting them.

A variety of companies, such as Eli Lilly, Nokia, and P&G, are also deploying informal open-innovation techniques. In 2001, for example, Lilly

created a wholly owned subsidiary—InnoCentive—that has recruited a distributed network of more than 80,000 research participants (called "solvers"), in over 170 countries, to help its clients find solutions to difficult R&D challenges. InnoCentive has more than 30 such clients (called "seekers"), including Dow Chemical, P&G, and its own parent, Lilly. When seekers confront a particularly difficult research challenge, they post their requirements to InnoCentive's solver network and offer a bounty to anyone who finds a solution. InnoCentive's success rate is roughly 50 percent—not bad for research problems that the seekers' internal R&D staffs couldn't handle.

Most interesting of all, perhaps, are the signs that InnoCentive's solver network is beginning to self-organize, with diverse solvers coming together to address a specific seeker's needs. This is a classic pull system: when needs can't be easily determined in advance, companies can create platforms to mobilize distributed resources readily.

Employee learning and education. Cisco Systems has shown how organizations can apply the new model to partner-training and -learning activities, which are increasingly important for the smooth functioning of global process networks. The company's groundbreaking (and robust) e-learning platform gives more than 40,000 of its distributed channel partners—with combined sales and technical staffs of 400,000-plus employees—access to training modules at times and places of their own choosing. Cisco and its partners are thus able to solve the problems of customers quickly.

Pull approaches are also highly visible in the context of open-source software. Discussions on that subject tend to focus on the innovative techniques used to produce complex systems by mobilizing highly distributed programming talent. Far fewer observers have noted the significance of open-source software as a platform for effective learning through apprenticeship. Open-source programmers often start with code developed by others and then develop enhancements for specific environments. As the code is generated, it is posted for review and testing by a broad community of experienced programmers. Participants in open-source projects learn at four levels: they observe and work with code from other programmers, they observe their own code in action, they get feedback and commentary from other people who execute their code, and they have access to feedback and commentary about code developed by other

EXHIBIT

A sharp contrast

Push systems	Pull systems
Demand can be anticipated	Demand is highly uncertain
Top-down design	Emergent design
Centralized control	Decentralized initiative
Procedural	Modular
Tightly coupled	Loosely coupled
Resource centric	People centric
Participation restricted (few participants)	Participation open (many diverse participants)
Focus on efficiency	Focus on innovation
Limited number of major reengineering efforts	Rapid, incremental innovation
Zero-sum rewards (dominated by extrinsic rewards)	Positive-sum rewards (dominated by intrinsic rewards)

open-source programmers. Participants begin on the periphery of the platform and advance, by building their skills, to become coaches and mentors. In this way, they structure their own learning environments, pulling in whatever resources are most relevant and timely.

Contrasting push and pull

Push systems contrast starkly with pull ones (exhibit), particularly in their view of demand: the former treat it as foreseeable, the latter as highly uncertain. This difference in a basic premise leads to fundamentally different design principles. For instance, instead of dealing with uncertainty by tightening controls, as push systems would, pull models address immediate needs by expanding opportunities for local participants—employees and customers alike—to use their creativity. To exploit the opportunities that uncertainty presents, pull models help people come together and innovate by drawing on a growing array of specialized and distributed resources.

Rather than seeking to constrain the range of resources available to participants, pull models constantly strive to expand it while helping participants to find the most relevant options. Rather than seeking to dictate the actions of participants, pull models give even people on the periphery the tools and resources (including connections to other people) needed to take the initiative and to address opportunities creatively as they arise. Rather than treating producers as passive consumers whose needs can be anticipated and shaped by centralized decision makers, pull models treat people as networked creators even when they actually are customers purchasing goods and services. Pull platforms harness their participants' passion, commitment, and desire to learn, thereby creating communities that can improvise and innovate rapidly.

The open-source world isn't the only niche community where this kind of learning and innovation now take place. The world of rare books, for instance, has been turned upside down by Amazon's ability to aggregate

the offerings of many local special-interest sellers; customers are no longer constrained by the quirky collections of titles assembled by owners of antiquarian bookshops in out-of-the-way physical locations. In extreme sports such as surfing and windsurfing, participants increasingly innovate and cocreate new offerings, such as footholds on windsurfing boards to enhance wave jumping.[2] And customized cars, or hot rods—automobiles modified to suit individual tastes—rank among the fastest-growing segments of the North American automobile market. In each of these cases, consumers are becoming more engaged in the creative and commercial processes.

Cocreation is a powerful engine for innovation: instead of limiting it to what companies can devise within their own borders, pull systems throw the process open to many diverse participants, whose input can take product and service offerings in unexpected directions that serve a much broader range of needs. Instant-messaging networks, for instance, were initially marketed to teens as a way to communicate more rapidly, but financial traders, among many other people, now use them to gain an edge in rapidly moving financial markets.[3]

How to pull

The benefits of pull systems should by now be clear: enhanced innovation, increased opportunity for collaboration, closer relationships with customers and suppliers, more rapid feedback, richer reflection on the results of distributed experimentation, and greater scalability, for example. In our view, however, the essential reason to begin implementing pull systems is the fact that they help companies to secure deeper sources of competitive advantage at a time when the traditional sources are disappearing. Although a comprehensive exploration of the way big corporations can assemble pull systems is beyond the scope of this article, several areas of focus are worth highlighting.

Use metaphors to deepen understanding

Push models are typically based on programs—an image that conjures up thick and tightly scripted manuals, standardized curricula, the offerings of network television, and software. By contrast, pull approaches tend to work on platforms, a word suggesting a more open-ended design, to

[2] Extreme sports are a particularly active area for user cocreation because their participants continually tinker with the equipment to reach the next level of performance. Participants themselves determine what is and isn't fair on a case-by-case basis, and through viral marketing useful innovations spread like wildfire.

[3] Information technology will play a central role in helping companies to make the shift from push to pull systems. IT will be radically transformed as it addresses the challenge of distributed pull systems spanning thousands of enterprises: "outside-in" IT architectures, for example, will replace traditional "inside-out" ones. We will discuss the IT implications of pull systems in greater detail in a working paper on our Web site: www.edgeperspectives.com.

accommodate the changing needs of participants. The right image is conveyed by Expedia's travel service or a hospital's emergency ward.

These platforms are invariably modular to help make resources and activities more accessible and flexible. Instead of being rigidly specified, as in push systems, the modular elements are "loosely coupled": they can be joined easily, without friction or customization, and just as easily disassembled and reassembled. Interfaces show users the contents of the module and how to access it.[4] A module might, for instance, consist of a business partner or partners (as in Li & Fung's global process network) or of a specialized tool (such as a radio telescope or an electron microscope that can be operated remotely through standardized interfaces).

Understand the spectrum

Pull platforms and push programs are not mutually exclusive. Li & Fung's global process network is a highly flexible pull platform, for example, yet many apparel producers participating in it organize their own resources in the traditional top-down way. Amazon and eBay use pull models to help consumers gain access to books produced by traditional push programs, but pull distribution systems are now creating opportunities to reconfigure the production process through publishing on demand.

Examine your mind-set

Companies incorporating pull platforms into their operations must challenge and refine their key assumptions about what is required for success: greater control, for instance, will no longer be the appropriate response to growing uncertainty, which must be seen as an opportunity, not a threat. Executives will have to stand back and let individual employees identify and mobilize resources and collaborators at the right time. In many cases, it will be necessary to transform not-invented-here cultures that prevent organizations from effectively leveraging third-party resources. Instead of wondering what companies can get from their business partners, executives will have to ask what they and their business partners can learn from one another.

Reexamine your company's focus

As we have noted, companies traditionally carry on three core processes: managing infrastructure, managing customer relationships, and creating and commercializing products. It's tough to be on the leading edge in all three areas, but in an effort to retain control, most companies try. More

[4] John Seely Brown, Scott Durchslag, and John Hagel III, "Loosening up: How process networks unlock the power of specialization," *The McKinsey Quarterly*, 2002 special edition: Risk and resilience, pp. 58–69 (www.mckinseyquarterly.com/links/17898).

versatile pull platforms let executives concentrate on becoming world class in one of the three processes, relying on external partners to supply the elements of the other two.[5]

Start where you are

In our experience, most companies already use pull platforms in fragmented and informal contexts. Executives can begin preparing for a more systematic and formal transition from push to pull by investigating how effectively their companies now utilize such pull capabilities and which of their most profitable revenue streams might be vulnerable to pull-oriented competitors. These executives can start to transform corporate operating processes by challenging the managers who run them to deploy additional pull capabilities as a way of meeting performance targets. And companies can begin to redesign the organization by making pivotal employees—engineers in a high-tech company, for example, or brand managers in a consumer goods one—responsible for creating a pull platform to improve the way they work, both within and outside the enterprise.

The cyberpunk author William Gibson has observed that "The future is already here—it is just unevenly distributed."[6] Pull systems may seem a remote threat, given their location at the periphery of many industries. Yet forces at the periphery can come to the center with astounding speed. As they do, business executives will have to reassess nearly every aspect of today's corporation. Q

[5] John Hagel III and Marc Singer, "Unbundling the corporation," *The McKinsey Quarterly*, 2000 strategy anthology, pp. 147–56 (www.mckinseyquarterly.com/links/17899).
[6] *Talk of the Nation*, National Public Radio, November 30, 1999.

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