Clouds, big data, and smart assets: Ten tech-enabled business trends to watch

Advancing technologies and their swift adoption are upending traditional business models. Senior executives need to think strategically about how to prepare their organizations for the challenging new environment.

Jacques Bughin, Michael Chui, and James Manyika

[1] James M. Manyika, Roger P. Roberts, and Kara L. Sprague, "Eight business technology trends to watch," mckinseyquarterly.com, December 2007.

[2] Two of the original eight trends merged to form a megatrend around distributed cocreation. We also identified three additional trends centered on the relationship between technology and emerging markets, environmental sustainability, and public goods.

Two-and-a-half years ago, we described eight technology-enabled business trends that were profoundly reshaping strategy across a wide swath of industries.[1] We showed how the combined effects of emerging Internet technologies, increased computing power, and fast, pervasive digital communications were spawning new ways to manage talent and assets as well as new thinking about organizational structures.

Since then, the technology landscape has continued to evolve rapidly. Facebook, in just over two short years, has quintupled in size to a network that touches more than 500 million users. More than 4 billion people around the world now use cell phones, and for 450 million of those people the Web is a fully mobile experience. The ways information technologies are deployed are changing too, as new developments such as virtualization and cloud computing reallocate technology costs and usage patterns while creating new ways for individuals to consume goods and services and for entrepreneurs and enterprises to dream up viable business models. The dizzying pace of change has affected our original eight trends, which have continued to spread (though often at a more rapid pace than we anticipated), morph in unexpected ways, and grow in number to an even ten.[2]

The rapidly shifting technology environment raises serious questions for executives about how to help their companies capitalize on the transformation under way. Exploiting these trends typically doesn't fall to any one executive—and as change

Takeaways

By disrupting traditional business models, technology is changing apace in areas such as wireless communications, sensors, and social networks.

New technologies could extend the reach of organizations, improve management decisions, and speed the development of new products and services.

To guide strategies, leaders should be tracking the evolution of new technologies and be alert to adoption rates among competitors in both established and emerging markets.

To avoid disruptions that may result from the excessively rapid adoption of technologies, companies should use "test and learn" methods when implementing them.

accelerates, the odds of missing a beat rise significantly. For senior executives, therefore, merely understanding the ten trends outlined here isn't enough. They also need to think strategically about how to adapt management and organizational structures to meet these new demands.

For the first six trends, which can be applied across an enterprise, it will be important to assign the responsibility for identifying the specific implications of each issue to functional groups and business units. The impact of these six trends—distributed cocreation, networks as organizations, deeper collaboration, the Internet of Things, experimentation with big data, and wiring for a sustainable world—often will vary considerably in different parts of the organization and should be managed accordingly. But local accountability won't be sufficient. Because some of the most powerful applications of these trends will cut across traditional organizational boundaries, senior leaders should catalyze regular collisions among teams in different corners of the company that are wrestling with similar issues.

Three of the trends—anything-as-a-service, multisided business models, and innovation from the bottom of the pyramid—augur far-reaching changes in the business environment that could

require radical shifts in strategy. CEOs and their immediate senior teams need to grapple with these issues; otherwise it will be too difficult to generate the interdisciplinary, enterprise-wide insights needed to exploit these trends fully. Once opportunities start emerging, senior executives also need to turn their organizations into laboratories capable of quickly testing and learning on a small scale and then expand successes quickly. And finally the tenth trend, using technology to improve communities and generate societal benefits by linking citizens, requires action by not just senior business executives but also leaders in government, nongovernmental organizations, and citizens.

Across the board, the stakes are high. Consider the results of a recent *McKinsey Quarterly* survey of global executives on the impact of participatory Web 2.0 technologies (such as social networks, wikis, and microblogs) on management and performance. The survey found that deploying these technologies to create networked organizations that foster innovative collaboration among employees, customers, and business partners is highly correlated with market share gains. That's just one example of how these trends transcend technology and provide a map of the terrain for creating value and competing effectively in these challenging and uncertain times.

1 Distributed cocreation moves into the mainstream

In the past few years, the ability to organize communities of Web participants to develop, market, and support products and services has moved from the margins of business practice to the mainstream. Wikipedia and a handful of open-source software developers were the pioneers. But

in signs of the steady march forward, 70 percent of the executives we recently surveyed[3] said that their companies regularly created value through Web communities. Similarly, more than 68 million bloggers post reviews and recommendations about products and services.

[3] "How companies are benefiting from Web 2.0: McKinsey Global Survey Results," mckinseyquarterly .com, September 2009.

Intuit is among the companies that use the Web to extend their reach and lower the cost of serving customers. For example, it hosts customer support communities for its financial and tax return products, where more experienced customers give advice and support to those who need help. The most significant contributors become visible to the community by showing the number of questions they have answered and the number of "thanks" they have received from other users. By our estimates, when customer communities handle an issue, the per-contact cost can be as low as 10 percent of the cost to resolve the issue through traditional call centers.

Other companies are extending their reach by using the Web for word-of-mouth marketing. P&G's Vocalpoint network of influential mothers is a leading example. Mothers share their experiences using P&G's new products with members of their social circle, typically 20 to 25 moms. In markets where Vocalpoint influencers are active, product revenues have reached twice those without a Vocalpoint network.

Facebook has marshaled its community for product development. The leading social network recently recruited 300,000 users to translate its site into 70 languages—the translation for its French-language site took just one day. The community continues to translate updates and new modules.

Yet for every success in tapping communities to create value, there are still many failures. Some companies neglect the up-front research needed to identify potential participants who have the right skill sets and will be motivated to participate over the longer term. Since cocreation is a two-way process, companies must also provide feedback to stimulate continuing participation and commitment. Getting incentives right is important as well: cocreators often value reputation more than money. Finally, an organization must gain a high level of trust within a Web community to earn the engagement of top participants.

Further reading

Jacques Bughin, Michael Chui, and Brad Johnson, "The next step in open innovation," mckinseyquarterly.com, June 2008.

Michael Chui, Andy Miller, and Roger P. Roberts, "Six ways to make Web 2.0 work," mckinseyquarterly.com, February 2009.

Josh Bernoff and Charlene Li, *Groundswell: Winning in a World Transformed by Social Technologies*, first edition, Cambridge, MA: Harvard Business School Press, 2008.

Clay Shirky, *Here Comes Everybody: The Power of Organizing Without Organizations*, reprint edition, New York, NY: Penguin, 2009.

Since cocreation is a two-way process, companies must also provide feedback to stimulate continuing participation and commitment.

2 Making the network the organization

In earlier research, we noted that the Web was starting to force open the boundaries of organizations, allowing nonemployees to offer their expertise in novel ways. We called this phenomenon "tapping into a world of talent." Now many companies are pushing substantially beyond that starting point, building and managing flexible networks that extend across internal and often even external borders. The recession underscored the value of such flexibility in managing volatility. We believe that the more porous, networked organizations of the future will need to organize work around critical tasks rather than molding it to constraints imposed by corporate structures.

At one global energy services company, geographic and business unit boundaries prevented managers from accessing the best talent across the organization to solve clients' technical problems. Help desks supported engineers, for example, but rarely provided creative solutions for the most difficult issues. Using social-network analysis, the company mapped information flows and knowledge resources among its worldwide staff. The analysis identified several bottlenecks but also pointed to a set of solutions. Using Web technologies to expand access to experts around the world, the company set up new innovation communities across siloed business units. These networks have helped speed up service delivery while improving quality by 48 percent, according to company surveys.

Dow Chemical set up its own social network to help managers identify the talent they need to execute projects across different business units and functions. To broaden the pool of talent, Dow has even extended the network to include former employees, such as retirees. Other companies are using networks to tap external talent pools. These networks include online labor markets (such as Amazon.com's Mechanical Turk) and contest services (such as Innocentive and Zooppa) that help solve business problems.

Management orthodoxies still prevent most companies from leveraging talent beyond full-time employees who are tied to existing organizational structures. But adhering to these orthodoxies limits a company's ability to tackle increasingly complex challenges. Pilot programs that connect individuals across organizational boundaries are a good way to experiment with new models, but incentive structures must be overhauled and role models established to make these programs succeed. In the longer term, networked organizations will focus on the orchestration of tasks rather than the "ownership" of workers.

Further reading

Thomas W. Malone, *The Future of Work: How the New Order of Business Will Shape Your Organization, Your Management Style, and Your Life*, illustrated edition, Cambridge, MA: Harvard Business Press, 2004.

Lowell L. Bryan and Claudia I. Joyce, *Mobilizing Minds: Creating Wealth from Talent in the 21st-Century Organization*, New York, NY: McGraw-Hill, 2007.

Albert-Laszlo Barabasi, *Linked: How Everything is Connected to Everything Else and What It Means for Business, Science, and Everyday Life*, New York, NY: Plume, 2009.

3

Collaboration at scale

Across many economies, the number of people who undertake knowledge work has grown much more quickly than the number of production or transactions workers. Knowledge workers typically are paid more than others, so increasing their productivity is critical. As a result, there is broad interest in collaboration technologies that promise to improve these workers' efficiency and effectiveness. While the body of knowledge around the best use of such technologies is still developing, a number of companies have conducted experiments, as we see in the rapid growth rates of video and Web conferencing, expected to top 20 percent annually during the next few years.

At one high-tech enterprise, the sales force became a crucible for testing collaboration tools. The company's sales model relied on extensive travel, which had led to high costs, burned-out employees, and difficulty in scaling operations. The leadership therefore decided to deploy collaboration tools (including video conferencing and shared electronic workspaces, which allow people in different locations to work with the same document simultaneously), and it reinforced the changes with a sharp reduction in travel budgets. The savings on travel were four times the company's technology investment. Customer contacts per salesperson rose by 45 percent, while 80 percent of the sales staff reported higher productivity and a better lifestyle.

In another instance, the US intelligence community made wikis, documents, and blogs available to analysts across agencies (with appropriate security controls, of course). The result was a greater exchange of information within and among agencies and faster access to expertise in the intelligence community. Engineering company Bechtel established a centralized, open-collaboration database of design and engineering information to support global projects. Engineers starting new ones found that the database, which contained up to 25 percent of the material they needed, lowered launch costs and sped up times to completion.

Despite such successes, many companies err in the belief that technology by itself will foster increased collaboration. For technology to be effective, organizations first need a better understanding of how knowledge work actually takes place. A good starting point is to map the informal pathways through which information travels, how employees interact, and where wasteful bottlenecks lie.

In the longer term, collaboration will be a vital component of what has been termed "organizational capital."[4] The next leap forward in the productivity of knowledge workers will come from interactive technologies combined with complementary investments in process innovations and training. Strategic choices, such as whether to extend collaboration networks to customers and suppliers, will be important.

Further reading

Andrew McAfee, *Enterprise 2.0: New Collaborative Tools for Your Organization's Toughest Challenges*, first edition, Cambridge, MA: Harvard Business School Press, 2009.

Erik Brynjolfsson and Adam Saunders, *Wired for Innovation: How Information Technology is Reshaping the Economy*, Cambridge, MA: The MIT Press, 2009.

James Manyika, Kara Sprague, and Lareina Yee, "Using technology to improve workforce collaboration," *What Matters*, October 27, 2009.

Wolf Richter, David Bray, and William Dutton, "Cultivating the value of networked individuals," in Jonathan Foster, *Collaborative Information Behavior: User Engagement and Communication Sharing*, Hershey, PA: IGI Global.

[4]Erik Brynjolfsson, and Adam Saunders, *Wired for Innovation: How Information Technology is Reshaping the Economy*, Cambridge, MA: The MIT Press, 2009.

4

The growing 'Internet of Things'

The adoption of RFID (radio-frequency identification) and related technologies was the basis of a trend we first recognized as "expanding the frontiers of automation." But these methods are rudimentary compared with what emerges when assets themselves become elements of an information system, with the ability to capture, compute, communicate, and collaborate around information—something that has come to be known as the "Internet of Things." Embedded with sensors, actuators, and communications capabilities, such objects will soon be able to absorb and transmit information on a massive scale and, in some cases, to adapt and react to changes in the environment automatically. These "smart" assets can make processes more efficient, give products new capabilities, and spark novel business models.[5]

Auto insurers in Europe and the United States are testing these waters with offers to install sensors in customers' vehicles. The result is new pricing models that base charges for risk on driving behavior rather than on a driver's demographic characteristics. Luxury-auto manufacturers are equipping vehicles with networked sensors that can automatically take evasive action when accidents are about to happen. In medicine, sensors embedded in or worn by patients continuously report changes in health conditions to physicians, who can adjust treatments when necessary. Sensors in manufacturing lines for products as diverse as computer chips and pulp and paper take detailed readings on process conditions and automatically make

adjustments to reduce waste, downtime, and costly human interventions.

As standards for safety and interoperability begin to emerge, some core technologies for the Internet of Things are becoming more widely available. The range of possible applications and their business impact have yet to be fully explored, however. Applications that improve process and energy efficiency (see trend number six, "Wiring for a sustainable world," later in this article) may be good starting points for trials, since the number of successful installations in these areas is growing. For more complex applications, however, laboratory experiments, small-scale pilots, and partnerships with early technology adopters may be more fruitful, less risky approaches.

Further reading

Michael Chui, Markus Löffler, and Roger Roberts, "The Internet of Things," mckinseyquarterly.com, March 2010.

Hal R. Varian, *Computer Mediated Transactions*, Ely Lecture to the American Economics Association, Atlanta, GA, January 3, 2010.

Bernhard Boser, Joe Kahn, and Kris Pister, "Smart dust: Wireless networks of millimeter-scale sensor nodes," Electronics Research Laboratory Research Summary, 1999.

Peter Lucas, "The trillion-node network," *Maya Design*, March 1999.

[5] Hal Varian explores some of these themes, along with the effects associated with "experimentation and big data" (described later in this article), in his 2010 American Economics Association lecture cited in this section's *Further reading*.

5 Experimentation and big data

Could the enterprise become a full-time laboratory? What if you could analyze every transaction, capture insights from every customer interaction, and didn't have to wait for months to get data from the field? *What if…?* Data are flooding in at rates never seen before—doubling every 18 months—as a result of greater access to customer data from public, proprietary, and purchased sources, as well as new information gathered from Web communities and newly deployed smart assets. These trends are broadly known as "big data." Technology for capturing and analyzing information is widely available at ever-lower price points. But many companies are taking data use to new levels, using IT to support rigorous, constant business experimentation that guides decisions and to test new products, business models, and innovations in customer experience. In some cases, the new approaches help companies make decisions in real time. This trend has the potential to drive a radical transformation in research, innovation, and marketing.

Web-based companies, such as Amazon.com, eBay, and Google, have been early leaders, testing factors that drive performance—from where to place buttons on a Web page to the sequence of content displayed—to determine what will increase sales and user engagement. Financial institutions are active experimenters as well. Capital One, which was early to the game, continues to refine its methods for segmenting credit card customers and for tailoring products to individual risk profiles. According to Nigel Morris, one of Capital One's cofounders, the company's multifunctional teams of financial analysts, IT specialists, and marketers conduct more than 65,000 tests each year, experimenting with combinations of market segments and new products.

Companies selling physical products are also using big data for rigorous experimentation. The ability to marshal customer data has kept Tesco, for example, in the ranks of leading UK grocers. This
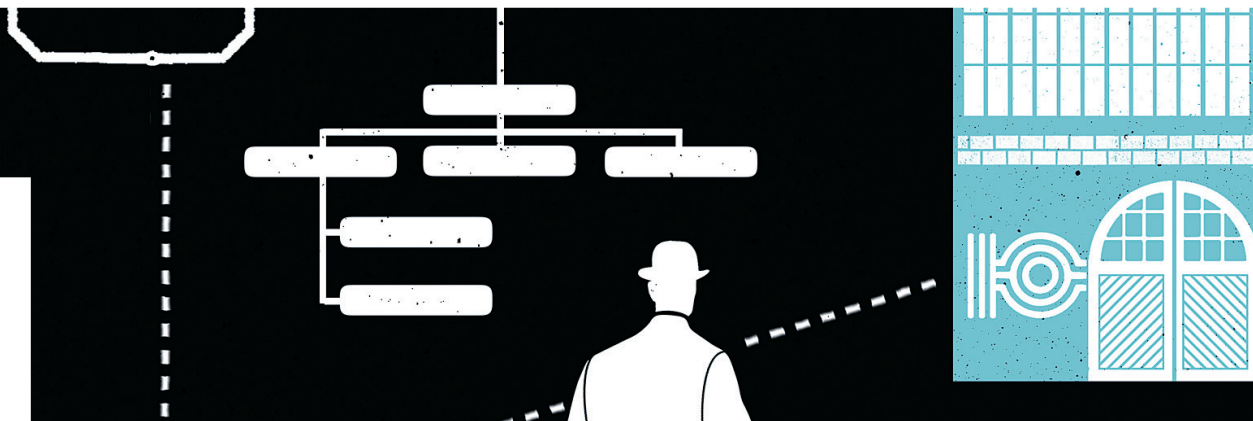
brick-and-mortar retailer gathers transaction data on its ten million customers through a loyalty card program. It then uses the information to analyze new business opportunities—for example, how to create the most effective promotions for specific customer segments—and to inform decisions on pricing, promotions, and shelf allocation. The online grocer Fresh Direct shrinks reaction times even further: it adjusts prices and promotions daily or even more frequently, based on data feeds from online transactions, visits by consumers to its Web site, and customer service interactions. Other companies too are mining data from social networks in real time. Ford Motor, PepsiCo, and Southwest Airlines, for instance, analyze consumer postings about them on social-media sites such as Facebook and Twitter to gauge the immediate impact of their marketing campaigns and to understand how consumer sentiment about their brands is changing.

Using experimentation and big data as essential components of management decision making requires new capabilities, as well as organizational and cultural change. Most companies are far from accessing all the available data. Some haven't even mastered the technologies needed to capture and analyze the valuable information they *can* access. More commonly, they don't have the right talent and processes to design experiments

and extract business value from big data, which require changes in the way many executives now make decisions: trusting instincts and experience over experimentation and rigorous analysis. To get managers at all echelons to accept the value of experimentation, senior leaders must buy into a "test and learn" mind-set and then serve as role models for their teams.

Further reading

Stefan Thomke, "Enlightened experimentation: The new imperative for innovation," *Harvard Business Review*, February 2001, Volume 79, Number 2, pp. 66–75.

Stephen Baker, *The Numerati*, reprint edition, New York, NY: Mariner Books, 2009.

Thomas H. Davenport, Jeanne G. Harris, and Robert Morison, *Analytics at Work: Smarter Decisions, Better Results*, Cambridge, MA: Harvard Business Press, 2010.

David Bollier, *The Promise and Peril of Big Data*, The Aspen Institute, 2010.

Janaki Akella, Timo Kubach, Markus Löffler, and Uwe Schmid, "Data-driven management: Bringing more science into management," McKinsey Technology Initiative white paper.

"Economist special report: The data deluge," the *Economist*, February 25, 2010.
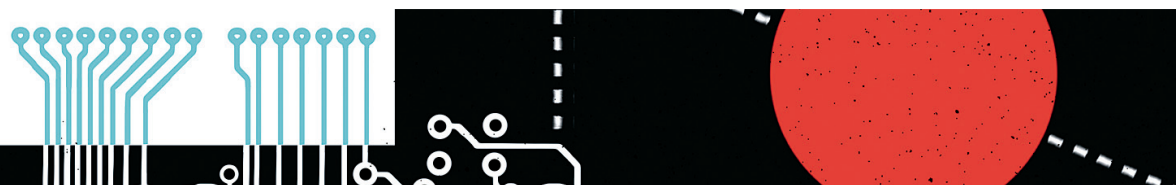
6 Wiring for a sustainable world

Even as regulatory frameworks continue to evolve, environmental stewardship and sustainability clearly are C-level agenda topics. What's more, sustainability is fast becoming an important corporate-performance metric—one that stakeholders, outside influencers, and even financial markets have begun to track. Information technology plays a dual role in this debate: it is both a significant source of environmental emissions and a key enabler of many strategies to mitigate environmental damage. At present, information technology's share of the world's environmental footprint is growing because of the ever-increasing demand for IT capacity and services. Electricity produced to power the world's data centers generates greenhouse gases on the scale of countries such as Argentina or the Netherlands, and these emissions could increase fourfold by 2020. McKinsey research has shown, however, that the use of IT in areas such as smart power grids, efficient buildings, and better logistics planning could eliminate five times the carbon emissions that the IT industry produces.

Companies are now taking the first steps to reduce the environmental impact of their IT. For instance, businesses are adopting "green data center" technologies to reduce sharply the energy demand of the ever-multiplying numbers of servers needed to cope with data generated by trends such as distributed cocreation and the Internet of Things (described earlier in this article). Such technologies include virtualization software (which enables the more efficient allocation of software across servers) to decrease the number of servers needed for operations, the cooling of data centers with ambient air to cut energy consumption, and inexpensive, renewable hydroelectric power (which of course requires locating data centers in places where it is available). Meanwhile, IT manufacturers are organizing programs to collect and recycle hazardous electronics, diverting them from the waste stream.

IT's bigger role, however, lies in its ability to reduce environmental stress from broader corporate and economic activities. In a significant push, for example, utilities around the world are deploying smart meters that can help customers shift electricity usage away from peak periods and thereby reduce the amount of power generated by inefficient and costly peak-load facilities. Smart grids can also improve the efficiency of the transmission and distribution of energy and, when coupled with energy storage facilities, could store electricity generated by renewable-energy technologies, such as solar and wind. Likewise, smart buildings embedded with IT that monitors and optimizes energy use could be one of the most important ways of reducing energy consumption in developed economies. And powerful analytic software that improves logistics and routing for planes, trains, and trucks is already reducing the transportation industry's environmental footprint.

Information technology is both a significant source of environmental emissions and a key enabler of many strategies to mitigate environmental damage.

Within the enterprise, both leaders and key functional players must understand sustainability's growing importance to broader goals. Management systems that build the constant improvement of resource use into an organization's processes and strategies will raise its standing with external stakeholders while also helping the bottom line.

Further reading

Smart 2020: Enabling the low carbon economy in the information age, The Climate Group, 2009.

Giulio Boccaletti, Markus Löffler, and Jeremy M. Oppenheim, "How IT can cut carbon emissions," mckinseyquarterly.com, October 2008.

William Forrest, James M. Kaplan, and Noah Kindler, "Data centers: How to cut carbon emissions *and* costs," mckinseyquarterly.com, November 2008.

7 Imagining anything as a service

Technology now enables companies to monitor, measure, customize, and bill for asset use at a much more fine-grained level than ever before. Asset owners can therefore create services around what have traditionally been sold as products. Business-to-business (B2B) customers like these service offerings because they allow companies to purchase units of a service and to account for them as a variable cost rather than undertake large capital investments. Consumers also like this "paying only for what you use" model, which helps them avoid large expenditures, as well as the hassles of buying and maintaining a product.

In the IT industry, the growth of "cloud computing" (accessing computer resources provided through networks rather than running software or storing data on a local computer) exemplifies this shift. Consumer acceptance of Web-based cloud services for everything from e-mail to video is of course becoming universal, and companies are following suit. Software as a service (SaaS), which enables organizations to access services such as customer relationship management, is growing at a 17 percent annual rate. The biotechnology company Genentech, for example, uses Google Apps for e-mail and to create documents and spreadsheets, bypassing capital investments in servers and software licenses. This development has created a wave of computing capabilities delivered as a service, including infrastructure, platform, applications, and content. And vendors are competing, with innovation and new business models, to match the needs of different customers.

Beyond the IT industry, many urban consumers are drawn to the idea of buying transportation services by the hour rather than purchasing autos. City CarShare and ZipCar were first movers in this market, but established car rental companies, spurred by annual growth rates of 25 percent, are also entering it. Similarly, jet engine manufacturers have made physical assets a platform for delivering units of thrust billed as a service.

A number of companies are employing technology to market salable services from business capabilities they first developed for their own purposes. That's a trend we previously described as "unbundled production." More deals are unfolding as companies move to disaggregate and make money from corporate value chains. British Airways and

GE, for instance, have spun off their successful business-process-outsourcing businesses, based in India, as separate corporations.

Business leaders should be alert to opportunities for transforming product offerings into services, because their competitors will undoubtedly be exploring these avenues. In this disruptive view of assets, physical and intellectual capital combine to create platforms for a new array of service offerings. But innovating in services, where the end user is an integral part of the system, requires a mind-set fundamentally different from the one involved in designing products.

Further reading

Nicholas Carr, *The Big Switch: Rewiring the World, from Edison to Google*, reprint edition, New York, NY: W. W. Norton & Company, 2009.

IBM and University of Cambridge, "Succeeding through service innovation: A service perspective for education, research, business and government," Cambridge Service Science, Management, and Engineering Symposium, Cambridge, July 14–15, 2007.

Peter Mell and Tim Grance, "The NIST definition of cloud computing," Version 15, October 7, 2009.

8 The age of the multisided business model

Multisided business models create value through interactions among multiple players rather than traditional one-on-one transactions or information exchanges. In the media industry, advertising is a classic example of how these models work. Newspapers, magazines, and television stations offer content to their audiences while generating a significant portion of their revenues from third parties: advertisers. Other revenue, often through subscriptions, comes directly from consumers. More recently, this advertising-supported model has proliferated on the Internet, underwriting Web content sites, as well as services such as search and e-mail (see trend number seven, "Imagining anything as a service," earlier in this article). It is now spreading to new markets, such as enterprise software: Spiceworks offers IT-management applications to 950,000 users at no cost, while it collects advertising from B2B companies that want access to IT professionals.

Technology is propagating new, equally powerful forms of multisided business models. In some

information businesses, for example, data gathered from one set of users generate revenue when the business charges a separate set of customers for information services based on that data. Take Sermo, an online community of physicians who join (free of charge) to pose questions to other members, participate in discussion groups, and read medical articles. Third parties such as pharmaceutical companies, health care organizations, financial institutions, and government bodies pay for access to the anonymous interactions and polls of Sermo's members.

As more people migrate to online activities, network effects can magnify the value of multisided business models. The "freemium" model is a case in point: a group of customers gets free services supported by those who pay a premium for special use. Flickr (online storage of photos), Pandora (online music), and Skype (online communication) not only use this kind of cross-subsidization but also demonstrate the leveraging effect of networks—the greater the number of free users, the more valuable

the service becomes for all customers. Pandora harnesses the massive amounts of data from its free users to refine its music recommendations. All Flickr users benefit from a larger photo-posting community, all Skype members from an expanded universe of people with whom to connect.

Other companies find that when their core business is part of a network, valuable data (sometimes called "exhaust data") are generated as a by-product. MasterCard, for instance, has built an advisory unit based on data the company gathers from its core credit card business: it analyzes consumer purchasing patterns and sells aggregated findings to merchants and others that want a better reading on buying trends. CHEP, a logistics-services provider, captures data on a significant portion of the transportation volume of the fastest-moving consumer goods and is now building a transportation-management business to take advantage of this visibility.

Not all companies, of course, could benefit from multisided models. But for those that can, a good starting point for testing them is to take inventory of all the data in a company's businesses (including data flowing from customer interactions) and then ask, "Who might find this information valuable?" Another provocative thought: "What would happen if we provided our product or service free of charge?" or—more important, perhaps—"What if a competitor did so?" The responses should provide indications of the opportunities for disruption, as well as of vulnerabilities.

Further reading

Chris Anderson, *Free: How Today's Smartest Businesses Profit by Giving Something for Nothing*, New York, NY: Hyperion, 2009.

Annabelle Gawer ed., *Platforms, Markets and Innovation*, Cheltenham, UK: Edward Elgar Publishing, 2010.

David S. Evans, Andrei Hagiu, and Richard Schmalensee, *Invisible Engines: How Software Platforms Drive Innovation and Transform Industries*, Cambridge, MA: The MIT Press, 2006.

9 Innovating from the bottom of the pyramid

The adoption of technology is a global phenomenon, and the intensity of its usage is particularly impressive in emerging markets. Our research has shown that disruptive business models arise when technology combines with extreme market conditions, such as customer demand for very low price points, poor infrastructure, hard-to-access suppliers, and low cost curves for talent. With an economic recovery beginning to take hold in some parts of the world, high rates of growth have resumed in many developing nations, and we're seeing companies built around the new models emerging as global players. Many multinationals, meanwhile, are only starting to think about

developing markets as wellsprings of technology-enabled innovation rather than as traditional manufacturing hubs.

In parts of rural Africa, for instance, traditional retail-banking models have difficulty taking root. Consumers have low incomes and often lack the standard documentation (such as ID cards or even addresses) required to open bank accounts. But Safaricom, a telecom provider, offers banking services to eight million Africans through its M-PESA mobile-phone service (*M* stands for "mobile," *pesa* is Swahili for "money"). Safaricom allows a network of shops and gas stations that sell

telecommunications airtime to load virtual cash onto cell phones as well.

In China, another technology-based model brings order to the vast, highly dispersed strata of smaller manufacturing facilities. Many small businesses around the world have difficulty finding Chinese manufacturers to meet specific needs. Some of these manufacturers are located in remote areas, and their capabilities can vary widely. Alibaba, China's leading B2B exchange, with more than 30 million members, helps members share data on their manufacturing services with potential customers and handles online payments and other transactions. Its network, in effect, offers Chinese manufacturing capacity as a service, enabling small businesses anywhere in the world to identify suppliers quickly and scale up rapidly to meet demand.

Hundreds of companies are now appearing on the global scene from emerging markets, with offerings ranging from a low-cost bespoke tutoring service to the remote monitoring of sophisticated air-conditioning systems around the world. For most global incumbents, these represent a new

type of competitor: they are not only challenging the dominant players' growth plans in developing markets but also exporting their extreme models to developed ones. To respond, global players must plug into the local networks of entrepreneurs, fast-growing businesses, suppliers, investors, and influencers spawning such disruptions. Some global companies, such as GE, are locating research centers in these cauldrons of creativity to spur their own innovations there. Others, such as Philips and SAP, are now investing in local companies to nurture new, innovative products for export that complement their core businesses.

Further reading

Jeffrey R. Immelt, Vijay Govindarajan, and Chris Trimble, "How GE is disrupting itself," *Harvard Business Review*, October 2009, Volume 87, Number 10, pp. 56–65.

"Special report on innovation in emerging markets: The world turned upside down," the *Economist*, April 15, 2010.

C. K. Prahalad, *The Fortune at the Bottom of the Pyramid: Eradicating Poverty Through Profits*, fifth edition, Philadelphia, PA: Wharton School Publishing, July 2009.

10 Producing public good on the grid

The role of governments in shaping global economic policy will expand in coming years.[6] Technology will be an important factor in this evolution by facilitating the creation of new types of public goods while helping to manage them more effectively. This last trend is broad in scope and draws upon many of the other trends described above.

Take the challenges of rising urbanization. About half of the world's people now live in urban areas, and that share is projected to rise to 70 percent

by 2050. Creative public policies that incorporate new technologies could help ease the economic and social strains of population density. "Wired" cities might be one approach. London, Singapore, and Stockholm have used smart assets to manage traffic congestion in their urban cores, and many cities throughout the world are deploying these technologies to improve the reliability and predictability of mass-transit systems. Sensors in buses and trains provide transportation planners with real-time status reports to optimize routing and give riders tools to adjust their commuting plans.

[6] Peter Bisson, Elizabeth Stephenson, and S. Patrick Viguerie, "Global forces: An introduction," mckinseyquarterly.com, June 2010.

Similarly, networked smart water grids will be critical to address the need for clean water. Embedded sensors can not only ensure that the water flowing through systems is uncontaminated and safe to drink but also sense leaks. And effective metering and billing for water ensures that the appropriate incentives are in place for efficient usage.[7]

Technology can also improve the delivery and effectiveness of many public services. Law-enforcement agencies are using smart assets—video cameras and data analytics—to create maps that define high-crime zones and direct additional police resources to them. Cloud computing and collaboration technologies can improve educational services, giving young and adult students alike access to low-cost content, online instructors, and communities of fellow learners. Through the Web, governments are improving access to many other services, such as tax filing, vehicle registration, benefits administration, and employment services. Public policy also stands to become more transparent and effective thanks to a number of new open-data initiatives. At the UK Web site FixMyStreet.com, for example, citizens report, view, and discuss local problems, such as graffiti and the illegal dumping of waste, and interact with local officials who provide updates on actions to solve them.

Exploiting technology's full potential in the public sphere means reimagining the way public goods are created, delivered, and managed. Setting out a bold vision for what a wired, smart community could accomplish is a starting point for setting strategy. Putting that vision in place requires

forward-thinking yet prudent leadership that sets milestones, adopts flexible test-and-learn methods, and measures success. Inertia hobbles many public organizations, so leaders must craft incentives tailored to public projects and embrace novel, unfamiliar collaborations among governments, technology providers, other businesses, nongovernmental organizations, and citizens.

Further reading

Jason Baumgarten and Michael Chui, "E-government 2.0," mckinseyquarterly.com, July 2009.

Bas Boorsma and Wolfgang Wagner, "Connected urban development: Innovation for sustainability," *NATOA Journal*, Winter 2007, Volume 15, Number 4, pp. 5–9.

O'Reilly Radar Government 2.0 (radar.oreilly.com/gov2)

Connected Urban Development (connectedurbandevelopment.org)

Building a smarter planet (asmarterplanet.com)

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The pace of technology and business change will only accelerate, and the impact of the trends above will broaden and deepen. For some organizations, they will unlock significant competitive advantages; for others, dealing with the disruption they bring will be a major challenge. Our broad message is that organizations should incorporate an understanding of the trends into their strategic thinking to help identify new market opportunities, invent new ways of doing business, and compete with an ever-growing number of innovative rivals.

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