Blurring boundaries, uncharted frontiers
Business ecosystems come of age
THE business environment has never been static, simple, or certain: Profound change, sometimes abrupt, sometimes gradual, has been reshaping the world for centuries. As recently as 1900, European empires straddled the globe, and the British empire alone contained 400 million people—25 percent of the world’s population. Only a tiny minority had ever stepped foot on foreign lands, or even travelled more than 50 miles from their place of birth. Well over 80 percent still lived on farms or rural communities. In the United States, already the world’s wealthiest country, life expectancy at birth was 47 years; about 7 percent of students completed high school; 1 percent of citizens held investments in public companies or mutual funds; only 19 percent of women worked for pay; just 3 percent of households were lit by electricity, and less than a third had running water. While scientific knowledge and technological capabilities had progressed greatly since the Enlightenment, they remained almost primitive by today’s standards.

But history was in motion. Between 1900 and 1905, Kodak would launch the Brownie—the first mass market camera; Marconi would transmit and receive transatlantic radio signals; the first narrative movie would be watched by millions around the United States in the first “nickelodeons”; the Wright brothers would take flight at Kitty Hawk; Hubert Booth would invent the first modern vacuum cleaner; a young Japanese playing card company, Nintendo, would start trading internationally; Henry Ford would incorporate his eponymous automobile firm; John A. Fleming would create the first practical vacuum tubes; Rutherford and Soddy would introduce their general theory of radioactivity; and the 26-year-old Albert Einstein would propose his theory of relativity and postulate the existence of photons. All of these—and many more events in that one brief historic window—were either enablers or manifestations of a rapidly expanding universe of new knowledge, capabilities, and potential.

Disruptive change is hardly a new phenomenon: Preceding generations have enjoyed and endured rapid shifts arguably even more transformative to their lives and work than those...
we experience today. And yet, it does appear inevitable that change will continue to accelerate. Knowledge begets knowledge; today’s technologies fuel and catalyze each other’s development; fast-spreading tertiary education opportunities around the globe are creating tens of millions of new actors in multiple fields of expertise; and massively enhanced connectivity combines, melds, and disseminates this increasingly rich mixture to accelerate learning and innovation.

The story of change in our time, however, is not only a story of speed. Even more disruptively, long-standing boundaries and constraints that have powerfully determined the evolution of business, the economy, and society are now blurring and even dissolving. As a result, a new era of extraordinary possibility and potential is unfolding. Unprecedented opportunities are inspiring entrepreneurs and innovators. But these are also challenging incumbent leaders and businesses to adapt and act with confidence in order to thrive in the future.

What’s behind this trend?

Many factors are together driving the transformation of the business environment. The global economy has changed beyond recognition. Newly powerful nations and organizations are growing, consuming, and helping to set new rules. Sustainability challenges, demographic shifts, and the needs of a new global “middle class” are increasingly important sources of innovation. Social and cultural shifts occur everywhere, empowered by an increasingly influential generation of entrepreneurial and impact-oriented “digital natives.” New ways of collaborating and interacting are creating new organizational forms, business models, and approaches to talent engagement. Evolving societal expectations and scrutiny of businesses are reshaping the regulatory environment and challenging the “license to operate” and “license to grow” for multiple industries.

Fueling all of these, however, is rapid technological advancement. Few would dispute the central importance of technology, especially digital technology, as the key source of change in recent decades. Nor would they deny that it will continue to play an absolutely critical role. As writer Stewart Brand has observed, computing is not like previous technologies—it is “autocatalytic,” or self-accelerating, as each development allows the next one to come about faster. Seymour Cray, when told that Apple Inc. had bought one of his Cray supercomputers to help design the next Macintosh computer, declared: “I just bought a Mac to help me design the next Cray!” Computers have also catalyzed rapid advances in other fields, including engineering, materials science, nanotechnology, and biotechnology.

Moore’s Law—which defines the remarkable exponential growth in computing power and decline in cost—has held for 50 years, despite recurring concerns it would hit technological limitations. It appears likely to endure longer; yet even if the pace should slow, the stage is already set for continuing digital disruption. After all, the process is still relatively new. The Internet only started entering the mainstream economy less than 20 years ago. Broadband access only overtook far slower dial-up modems about 10 years ago. Mobile devices designed for a digital economy—notably smartphones and tablets—arrived about
seven years ago, and cloud computing and storage became truly effective shortly afterward. Even more recently we have witnessed the growing reach and power of software “applications,” already altering the worlds of individuals and enterprises alike. Today the “Internet of Things” (connecting objects just as the Internet has connected people) is poised for takeoff. And the ability to analyze and interpret massive amounts of new data will grow, as machine intelligence continues to evolve, generating powerful new insights and predictive capabilities.

Digitization of the economy has already had tremendous impact, but we are only beginning to witness the sheer scale and scope of its transformative power.

The trend

Increasingly, businesses operate in complex, dynamic, and adaptive ecosystems. A variety of phenomena—including feedback loops, stocks and flows, scaling and network effects, power laws, and so on—must be understood to properly appreciate and anticipate how systems behave and might evolve. But one major change is already underway. The fundamental boundaries that have specified the relationships, interactions, and possibilities of most businesses are rapidly blurring and dissolving. Historically, when boundaries have moved—geographic, scientific, technological, institutional, or cultural—the results have been momentous. When multiple boundaries shift simultaneously—as happened during the Enlightenment and the Industrial Revolution—truly extraordinary breakthroughs and great strides in human progress occur, through the creation of new connections, possibilities, and ideas.

Many long-standing boundaries have been blurring in recent decades. Industries and sectors have been converging, reducing the clear lines of demarcation originally defined and codified almost 80 years ago. Boundaries between and within firms have been weakening. Old distinctions between products and services are breaking down as businesses traditionally specializing in one seek to integrate the other, to create fuller “solutions” and more compelling experiences that serve customers’ growing expectations. The historically profound gaps between the capabilities and influence of large and small organizations are steadily declining. For many individuals, the boundary between paid work and passionate pursuit of interests and hobbies is falling.

Even the respective roles and contributions of the private, civic, and public sectors are blurring. Businesses were historically driven by market values, and the civic sector by moral and social values; governments set the rules and provided public goods. Today, they are merging and becoming increasingly interdependent through new partnerships and collaborations—often in pursuit of shared goals in light of another blurring, as externalities become internalized within market-based solutions. The liberalization of trade policies following the demise of the Soviet Union has served both to soften borders between countries, and also greatly diminish the vast dividing line between the “developed” and “emerging” economies. Cross-fertilization and increasing collaboration across scientific and technological domains are dissolving multiple knowledge boundaries.

These are all crucial changes and are already impacting every sector and almost every business today. But three key types of blurring are poised to have growing and ubiquitous impact.

The human-machine boundary

From the advent of the most basic tools, technologies have always replaced and expanded upon human endeavor. The Industrial Revolution brought widespread mechanization of routine manual labor—a process continued ever since through multiple manufacturing innovations. The advent of office machines, especially computers, expanded automation into the cognitive domain—again, mainly in routine areas, as software algorithms captured well-codified and rule-based procedures and expertise, enabling faster, cheaper, and more reliable business
operations. Meanwhile, since General Motors introduced the first industrial robots in the 1960s, machinery has been steadily extending its reach into nonroutine manual work.10 Recently, for example, the US Navy tested a prototype bipedal firefighting robot equipped with multiple sensing and actuation capabilities.11 General Electric is designing robots that can, for example, climb and maintain wind turbines.12

There will be further machine encroachments into manual work and routine cognitive fields, but the new and transformative blurring boundary today is occurring in the nonroutine cognitive domain, which has historically largely defied automation. Artificial Intelligence (AI), including machine learning, natural language processing, knowledge representation, machine-to-machine communication, and automated reasoning, is evolving fast.13 Investment here has exceeded $17 billion since 2009, with private investment growing around 62 percent a year.14 The extraordinary consequences are already becoming manifest. Apple’s Siri voice recognition software applies natural language recognition to interpret and act upon spoken words. Google Translate has over 500 million active users every month, and now features a “conversation mode” that enables real-time bilingual conversations.15 Self-driving vehicles have been road tested for millions of miles.16 Symantec’s Clearwell software, designed to address the explosion of “e-discovery” efforts in legal matters, uses language analysis to review and sort hundreds of thousands of documents in just hours.17 IBM’s Watson, having won Jeopardy!, is now detecting and diagnosing medical conditions and outlining patient-care plans.18 Financial services firms such as Betterment and Wealthfront provide automated, customized investment advice. The Associated Press (AP) is implementing a system to automate the writing of corporate earnings reports, allowing reporters to concentrate on tasks that require more ingenuity and add more value—“more journalism and less data processing” in the words of the AP’s Lou Ferrera.19

Looking ahead, the implications of increasingly autonomous non-human intelligence are profound, though still uncertain. Many, including scientist Stephen Hawking and entrepreneur Elon Musk, have voiced serious, perhaps existential, concerns regarding the potential consequences.20 More immediately, however, we need only look backward at the transformative impacts of automation on manual and routine cognitive work—growth, productivity, and prosperity, alongside challenging social disruptions—to get a sense of the sheer scale of what likely lies just around the corner.

The producer-consumer boundary

Another clearly drawn line quickly losing resolution is the distinction between producers and consumers. In the first half of the twentieth century, powerful producers forged and dominated the new industrial era; consumers were the passive recipients of their output, far from active participants. In recent decades, increased choice enhanced consumers’ power in the marketplace, but they were engaged rarely and weakly, through mechanisms like focus groups. Persuasion prevailed over participation. Even today, many businesses declare themselves “customer-centric,” but still strategize around “value chains” that relegate consumers to the far end of increasingly complex production arrangements.

Such approaches are becoming increasingly inadequate as the old boundaries between producers and consumers blur in a variety of ways. Consider YouTube, where millions of users create and share 300 hours of content every minute.21 Today, we also see people contributing real value to many communities of shared interests and needs—related to, for example, particular medical conditions or hobbies—and to blogs, citizen journalism, and other knowledge- and opinion-sharing portals. Five of the ten most popular web content sites worldwide are primarily user-generated.22

But consumers have also become deeply engaged in the production of physical products. In some cases, ecosystems of “makers”
empowered by newly accessible and affordable technologies, are actually leading the evolution of products—for example, drones. More commonly, consumers help design, improve, and prioritize within existing categories, on powerful platforms established by many firms explicitly for “co-creation.” UK-based startup MakieLab, for example, allows customers to create one-of-a-kind 3D-printed dolls using its FabLab app. A similar concept underpins the successful fashion company Threadless, which gets all the graphics for its T-shirts as submitted designs and allows visitors to its site to vote for the ones Threadless should produce. Such approaches are being further spread through the increased deployment of prizes and competitions, and the growing success of crowdsourcing businesses such as Applause, the world’s largest open community dedicated to professional testers of software.

More recently, peer-to-peer networks have proliferated, enabling individuals to “share” their assets, skills, and time. Businesses like Airbnb, Uber, and SoMoLend, for example, are creating radically different and fast-scaling options in hospitality, mobility, and finance, respectively. In some instances these are making previously “idle” assets productive, thereby benefitting society; but as such networks spread to other parts of the economy, they will threaten the existing business models of many incumbents.

Consumers are also prolific producers of arguably the most valuable commercial resource today—massive volumes of data. Consider the data exhaust captured by Google’s aggregation and prioritization of our searches. Or Amazon’s “collaborative filtering” which captures our preferences to promote suggestions to like-minded people. And, as companies increasingly enable their customers to customize their own products, services, and experiences, they will accumulate ever more prodigious amounts of individual and collective data. As more of our lives move into the digital arena, almost every action and choice will create and transmit dynamic data with latent value—posing both new opportunities, and new dilemmas.

The physical-digital boundary

Digitization began influencing the physical economy 50 years ago, with information technology automating many business processes. The advent of the Internet increased the pace, scope, and scale of that process, with some commentators initially distinguishing between an “old” physical and “new” digital economy: “E-commerce” was different from “commerce,” “bricks and mortar” separate from “online.”

That boundary, however, quickly blurred, with terms such as “clicks and mortar” and “omni-channel” emerging in retail, for example, to describe a much more blended and integrated reality.

Now, the physical and digital worlds are converging rapidly in the form of increasingly “smart” objects. The Internet of Things (IoT) is enabled by many factors, including increasing capabilities and falling costs of sensors, actuating devices, and wireless connectivity, and the massive expansion of the Internet Protocol registration regime, IPv6. By connecting far-flung devices, objects, and infrastructure, the IoT enables not only remote real-time awareness, but autonomous adjustment and control to optimize performance, while creating yet more data. For example, the Nest Learning Thermostat senses your presence or absence at home, tracks your heating preferences over time, and adjusts temperatures accordingly. By aggregating what it learns from your and every
other household, it continuously improves its algorithms based on large-scale patterns.\textsuperscript{27} The IoT is spreading across the economy. Gartner has estimated about 26 billion connected objects (excluding smartphones and tablets) by 2020;\textsuperscript{28} Cisco predicts 50 billion;\textsuperscript{29} and Morgan Stanley 75 billion.\textsuperscript{30} Every sector, from health care to security, will be altered. But this is not the only technology blurring the boundaries of the physical and digital worlds. 3D printing enables production of an expanding range of physical goods from digital files, from OwnFone’s simple yet customizable made-to-order mobile phones to NASA-designed tools that can be printed in space.\textsuperscript{31} With significant innovation broadening the array of “printable” materials, this will only accelerate. For example, Organovo is today printing scaled-down human livers,\textsuperscript{32} which it sells to pharmaceutical companies for drug-testing purposes, while researchers in Australia have figured out how to print stem cells,\textsuperscript{33} a step toward lab-grown hearts and brains. In another interesting twist, AutoDesk has recently offered as a free public beta its Memento software, which enables non-experts to turn digital images (scans or photos) of physical objects back into 3D models that can then be physically printed!\textsuperscript{34} Looking ahead, there is perhaps an even more profound blurring of the physical and digital worlds, as advances in virtual reality technology enable increasingly lifelike “alternate” digital worlds. While virtual reality is
today deployed primarily in the gaming space, Facebook’s recent $2 billion acquisition of Oculus VR perhaps hints at a future of fully immersive connections for maintaining social relationships and sharing information, weaving even more digital threads through the physical fabric of our lives.

Implications

Boundaries typically produce constraints, limiting choices and actions and reducing efficiency. As they diminish, wonderful new opportunities flourish. So, too, does upheaval. The old boundaries and constraints were limiting, but also clarifying. They provided definition and focus, framed what was possible, pointed clearly to sources of advantage, and informed the key elements of business strategy and operations for many decades. Therefore, blurring boundaries are creating extraordinary new potential for the economy and broader society, and enabling remarkable innovation and entrepreneurship; and at the same time, they are also creating new challenges, especially for incumbents who have been masters of the previous game. Successful leaders will have to address increasingly urgent issues regarding cybersecurity and the “fair usage” of data; figure out optimal ways to organize and to access talent; and adopt more dynamic approaches to strategy with far greater built-in optionality.

Cybersecurity and data

The blurring boundary between the physical and digital worlds is a fundamental driver of transformation, creating connections, data, and capabilities that are reshaping almost every part of our lives. But it also presents two substantial and unresolved challenges. First, maintaining a secure, global, open Internet; and second, determining the appropriate use of the mushrooming data we are all generating every day in myriad ways.

Of the various threats to the Internet, the greatest is arguably “hacking”—for fun, for illegal profit, for access to confidential information, for malicious disruption and damage, and for various ideological reasons. The number of detected cyber-attacks increased by nearly 50 percent in 2014 (reaching some 120,000 per day), while identity theft (up 70 percent) and cybersecurity (up 61 percent) were the top two security concerns for American citizens. President Obama’s urgent call in his 2015 State of the Union address for more collaboration between government and business on this front raises the prospect of greater collective prioritization—and innovation—for years to come.

Similar collaboration and innovation will also be occurring in the domain of data—their capture, ownership, distribution, and monetization. An order of magnitude more data will be produced in the years ahead, analytics will continue to get far smarter and more predictive, and opportunities to create value will proliferate. Yet critical issues regarding privacy, ethical questions posed by the ability of data to be used in discriminatory ways, and tensions over ownership of and value extraction from data produced through the activities of citizens are all rising. There have been substantial breaches of trust in the past—some occurring because data was not adequately protected from theft or hacking and others because the data was inappropriately exploited by those stewarding it—and there will be more in the future. The resulting erosions in public trust are becoming more costly and are rapidly rising on the corporate agenda as businesses increasingly view the data they are co-creating with customers as one of their more valuable assets.

Evolving organization designs and talent models

Few organizations today bear much resemblance to their counterparts of 30 years ago. As the changing business environment has heightened the imperatives of innovation, agility, and resilience, organization design has changed dramatically. Multiple layers of “command and control” hierarchies have been reduced. Many isolated internal siloes have been connected
and integrated. Core competences have been prioritized, the rest assigned to sophisticated supply chains or otherwise outsourced or “virtualized.” Key business processes have been automated. Digital technology and connectivity have enabled these developments, which have been transformative. But this journey is far from over. As value creation across ecosystems continues to grow in importance, organizations will continue to be further optimized for effective networking, collaboration, and fluidity.38

Recently, talent models in particular have evolved. Long-term employment has been eroding while contracting talent only “as needed” becomes more common. An Intuit report estimates that over 60 million Americans will be “contingent” workers by 2020;39 87 percent of executives leading global human resource functions have altered or are considering changes to their talent sourcing strategy;40 and 70 percent of Millennials expect to spend part of their career working independently.41 An enabling infrastructure of crowdsourcing and competitions has been growing fast. Specific tasks can increasingly be allocated through TaskRabbit or Amazon Mechanical Turk; entire projects can be planned and responsibilities distributed using, for example, Elance and oDesk; invention ideas can be crowdsourced, designed, and commercialized through Quirky; and marketing needs can be addressed by Tongal’s platforms of tens of thousands of creatives. Talent models will be changed further by increased automation of some types of knowledge work. Companies such as HCL Technologies and Wipro are already talking about the “hourglass” structures that will replace existing “pyramids” as artificial intelligence extends deeper into software testing and IT support functions.42

Dynamic strategy

More than anything, business leaders will have to adopt new approaches to strategy. Successful business strategy will remain anchored on setting clear aspirations, making well-informed and integrated choices regarding where to play and how to win, and developing the essential capabilities to support these ambitions. However as boundaries blur, the universe of options for creating value is increasing substantially; “winning” increasingly requires collaboration as well as competition with others; essential capabilities need not necessarily be owned or directly controlled; capturing value is becoming more challenging, often requiring the creation of new business models; and the need for enhanced agility means our strategies must be increasingly capable of rapid flex and adaptation.

Approaches to strategy are likely to evolve as a consequence, in a variety of ways that are already becoming evident. More emphasis will be placed on designing and renewing business models that take fuller account of the importance of relationships outside the firm.

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What’s next?

The significant erosion of long-standing boundaries will likely result in two very different outcomes: New possibilities will be discovered and deployed that will have transformative impact; and some new boundaries will surely also arise to present different challenges. Writer William Gibson has suggested that “The future is already here—it’s just not evenly distributed yet.” We have already seen powerful cross-cutting ecosystems transform the once-separate sectors of computing, telecommunications, and media. As digitization spreads everywhere, we must expect similar blending and dynamism across the economy. Just as we have seen the growing phenomenon of temporary “pop-up” restaurants and even retail outlets, might the future hold “pop-up firms”? After all, as writer Clay Shirky has noted, it is becoming increasingly possible to “organize without organizations.” Just as automation has started to make serious inroads into non-routine cognitive work domains, might AI move next into the world of creativity? Software programs are, after all, already producing distinctive gallery exhibited drawings and composing music.

New boundaries are already visible as well. Geopolitical tensions that were relieved following the collapse of the Soviet Union appear once more to be rising. Fundamentalist belief systems—an obviously divisive force in human affairs—are proving tragically consequential. While the gap between “rich” and “poor” globally is on some measures declining, the divide between the extraordinary wealth of those at the top (the 10 wealthiest individuals own around half a trillion dollars)—and the vast majority of the rest is of growing concern. Our dynamic economy greatly rewards restless entrepreneurship. Might new fault lines evolve between those well equipped for such a world and those more suited to a steadier and less frenetic world of employment? Inevitably, as old boundaries and frictions disappear, new ones will appear.

Yet if we can figure out how to live together on our shared planet, the future prize is extraordinary. The new art of the possible—from far more effective deployment of assets and resources to collaborative integration of expertise and passion—can help smarten and strengthen Adam Smith’s “invisible hand” to create a more sustainable, global, and prosperous civilization. Today, that prize is within our reach, but not yet—not quite—within our grasp. That will perhaps be the greatest challenge ahead, shared by the leaders of today, and tomorrow.
My take

By Paul Saffo

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Let’s consider the grand sweep of this story. Once upon a time there was just the physical, analog domain. We then started creating and linking digital machines. The resulting bubble of cyberspace was initially small, but it has been growing rapidly since. As it expands, it encroaches on the analog, not in a science fiction kind of way, but in a very real kind of way. Now, even the basic notion of a boundary between digital and the analog is increasingly passé. The world has become more permeable, with much of the most interesting innovation coming from economic “edges” rather than from the historic centers.

“Interfacing” is what once happened through screens, keyboards, and other operating panels that separated humans and machines while still allowing them to connect. Today, we no longer interface with machines—so much as we interact with them. The distinction is subtle, but important because today’s more intimate human-machine mingling allows for practically instantaneous and transparent two-way communication enabled by sensors, monitoring, and environmental feedback. Leading firms today are often forced to acknowledge that some of their most important employees are actually machines.

Increasingly, no hard border needs to be crossed in order for insight to exchange “hands” from a person to a thing. Planes, trains, and subways, for example, may still have human operators, but none of them could successfully complete their assigned tasks without guidance, and even fundamental coaching, from machines. The drivers don’t need to ask for advice, because the supporting technology is smart enough to simply reach in and offer it. These transactions can be so seamless, and effective, that some organizations are now putting measures in place to guard against human overreliance on technology. For example, next-generation autopilot design now includes machine-generated prompts reminding pilots to remain engaged.

We tend to structure our organizations to reflect our dominant communications systems. In the age of telephony and mainframe computing, organizations were more hierarchical and centralized. As networked communications have evolved, we have increasingly drawn upon organizational designs that are decentralized and even more organic. If I could offer one piece of advice to today’s leaders, it would be to read more broadly in ecology and biology. Key ideas like symbiosis and co-evolution are central in that literature and businesses will increasingly need to master them to thrive. Many leaders can also borrow important biological lessons about sharing resources and cross-pollinating ideas in the “intertidal zones” that increasingly link businesses and turn out to be fantastically rich places to innovate.
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Endnotes


37. Some scholars have characterized the effort to balance protection of privacy and the benefits of big data as possibly the biggest public policy challenge of our time. See Ira Rubinstein, “Big data: The end of privacy or new beginning?,” International Data Privacy Law no. 3, 2013, DOI: 10.1093/idpl/ips036.

38. For more information on the implication of this fluidity on legacy supply chain management, see “Supply chains and value webs.”


Contact
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