Leading a Bionic Transformation

Three new kinds of capital give companies a new source of leverage and power.

BY MILES EVERSON, JOHN SVIOKLA, AND KELLY BARNES
THREE NEW KINDS OF CAPITAL GIVE COMPANIES A NEW SOURCE OF LEVERAGE AND POWER.

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What is it about companies such as Alphabet, Amazon, Apple, and Alibaba? No matter where they turn their attention — cars, banking, groceries, healthcare, media, retail, trucking — industries quail before them. Company leaders start wondering if their moats are deep enough. Investors flee before the drawbridges rise. These companies are among the largest and richest in the world, and they use this leverage to become larger and richer still — in 2018, Apple and Amazon became the world’s first trillion-dollar companies. These powerhouses attract huge numbers of extremely talented people to work for them, and they generate one innovation after another. But none of that explains the source of their industry-disrupting power.
There are probably 100 companies around the world — including at least 40 “unicorns,” startups with a market capitalization of US$1 billion or more — with similar qualities. They are known for rapid, exponential success. Most are in the U.S. and China right now, but they will probably become more common elsewhere soon. We think of them as bionic enterprises: a name that evokes the fusion of technological and biological systems for extraordinary performance and growth. These companies compete in unprecedented ways by combining digital prowess, human ingenuity, and strategic purpose, as if they were the corporate equivalent of superhuman cyborgs such as Marvel Comics’ Iron Man.

Over the past year, as we’ve been researching and writing about the nature of bionic companies (see “The Bionic Company,” by Miles Everson and John Sviokla, s+b, Feb. 22, 2018), it’s become apparent that no company has a monopoly on this way of doing business. A few companies are out in front, but many others will follow. Some will be part of consortia; some will take advantage of highly capable platforms. You can lead your own company toward a bionic transformation if you think about changing your business in the following ways.

• From a business model based on managing the supply of your product or service to one based on providing whatever customers demand, using any means possible
• From an operational approach based on stocks of information that you hold and capture, to one based on flows of knowledge that you collaborate on and share
In the 19th century, when the modern corporation emerged, its success stemmed from the management of three long-standing forms of capital. These sources of wealth had existed throughout history, but now could be developed with unprecedented speed at unprecedented scale. They are natural capital (land, water, and other environmental resources), human capital (the development and deployment of talent), and financial capital (money, in all its forms). The steam engine, the telegraph and telephone, the railroad, and the other technological advances of that time allowed large enterprises to deploy these forms of capital in new ways. This spurred yet more innovation and dramatically transformed the world, generating vast amounts of new wealth.

Today’s new industrial revolution, as it is sometimes called, involves a similar release of wealth, again in the form of innovative assets. To be sure, companies today still deploy natural, human, and financial capital as their predecessors did. But the secret of their success lies in three new forms of capital, brought to life by today’s integrated technologies:

**Behavior capital:** The collection, aggregation, and modeling of data, in a way that yields valuable insights. Sources of data have proliferated with the Internet of Things, an infrastructure embedded with sensors and other data-gathering devices. The assets generated from this data often take the form of digital models of real-world activity, revealing how people, machines, and systems have behaved in the past, how they are likely to behave in the future, and how that behavior can be influenced.

Behavior capital gives companies visibility into their systems that they otherwise wouldn’t have. It reduces error and risk: A decision maker can take chances in the virtual world that would be unbearable in real life. It raises the ability of companies to control their operations more effectively and substitute new products for old ones more easily and rapidly as circumstances change.

One of the most successful generators of behavior capital is the Waze navigation app (acquired by Google in 2013). Originally developed in Israel, it found early use in restricted zones, where maps are unreliable and dangerous situations may develop. It ultimately found a passionate audience among commuters and others seeking to avoid traffic delays. The information that Waze provides is generated in part from machine learning; it knows what the traffic patterns have been and how they might change. It also incorporates data from its users’ speed and behavior; when they slow down in a traffic jam, that information instantly becomes part of the Waze model. Waze users can also report on road conditions; as they participate in the Waze system, it becomes more accurate. Its behavior and users’ behavior interact.

**Cognitive capital:** This asset gains its value from computability, the automation of cognitive tasks. Most companies have established great reservoirs of practical knowledge; now they can transfer that knowledge and accelerate innovation.
knowledge into autonomous entities, which can act on it at scale. As decision-making capabilities move into software, embedded not just in computer systems but in intelligent devices, robots, vehicles, and massive industrial platforms, an enterprise can operate at vastly greater scale. When this phenomenon is managed responsibly, it creates enormous value.

One example of cognitive capital is the digital twin, a computer-based virtual simulation of technological and business systems. Thanks in part to its use of machine learning, the simulation can embed all the knowledge typically used to operate and maintain its real-world equivalent, including the information that is hard to codify. Then it can use that information to simulate responses to changing conditions. Thus, for example, if you want to know how your refining plant would operate in flood conditions, you can adjust your digital twin — and, through the simulation, learn in advance what types of preventive maintenance would allow the plant to best weather the storm.

Cognitive capital has been available in rudimentary form for years; any interactive voice-response phone system represents a kind of cognitive capital. But it takes on much more value when it is sophisticated. Banks, for example, can use algorithms to model how different customers will respond to new financial-services offers, taking into account their circumstances (for instance, how far they are from retirement), along with sociodemographic, health, and financial factors derived from data about millions of people. The algorithm can then offer new services to its customers, tailored to their priorities.

Network capital: Companies by their nature are hubs, connecting their customers, their employees, and those who generate information about their projects. When the Internet emerged, the value of network capital rose dramatically. Unlike broadcast networks, Internet-based networks can manage many-to-many communications: They allow participants to communicate not just with the central hub, but also with one another.

Amazon’s recommendations engine, for instance, links people through their product reviews. Many people have gotten into the habit of looking up reviews on the network before buying anything significant. An Amazon apparel-buying service called Echo Look has gone further with network capital. When trying on clothes at home, customers can use Echo Look to ask other people across the Internet for their opinions. All those opinions are captured for use in Amazon’s R&D and marketing, which further extends its behavior capital.

- From a competitive position based on a stable landscape of rivals to one based on platforms where a single winner dominates the system.

Underlying these three shifts of mind is a quiet revolution in the sources of wealth that businesses deploy and create — the first such major shift since the Industrial Revolution. These new intangible (but very powerful) assets are behavior capital, the awareness and insight developed by tracking ongoing activity; cognitive capital, knowledge codified into digitally managed routines; and network capital, the human and technological connection points available to an enterprise (see “Wealth in the 21st Century”). When you deploy these three forms of capital effectively, you transform your enterprise.

Just a year or two ago, transformation was seen as a response to disruption. You changed the way you operated so you could escape being disrupted — or
perhaps so you could disrupt your rivals. Now, the goal of transformation is to find an identity that will allow your company to thrive in a bionic environment: to create value in ways that weren’t possible before, taking advantage of the infrastructure of the Industrial Internet, as new to our world as electricity and skyscrapers were in the late 19th century. More and more companies are making this shift, more rapidly than you might expect. Individual enterprises that hold back will find themselves swept forward anyway by their customers, competitors, employees, and investors — and, if they continue to resist, ultimately by their acquirers.

**Beyond Individual Enterprise**

One example of broad-based bionic transformation is occurring in an industry that until recently was widely held to be one of the slowest and most unyielding to change: healthcare. As Robert M. Wachter, chair of the department of medicine at the University of California, San Francisco, put it in his book *The Digital Doctor*, “The simple narrative of our age — that computers improve the performance of every industry they touch — turns out to have been magical thinking when it comes to healthcare.” Just three years ago, when Wachter published those lines, there were reasons to be skeptical of healthcare technology. Early efforts to set up electronic patient records faltered; the attempted monetization of patient data didn’t pay off; and competition among providers, payors, and other industry participants created high levels of mistrust.

But Wachter’s conclusion was premature. Since he published his book, a
group of technology companies, including Amazon, Google, and Microsoft, have announced their entrance into healthcare businesses. Some health industry firms are restructuring themselves to play more platform-oriented roles. Case in point: the merger of CVS and Aetna. Change is happening at the consortium level, because no single company can gather enough data to create the necessary behavior capital, and no single hospital can reach enough people with its cognitive capital. The data sources of a region or a country must be integrated together.

As we write this article, the necessary consortia are beginning to come together. (Disclosure: Our firm, PwC, is participating in the creation of consortia like these in healthcare, using a platform known as DoubleJump Health.) Wachter himself says he sees these platforms finally changing the way the health system works. “We are learning to use [digital] technology in new ways, and we are starting to make headway,” he recently told strategy+business.

One major consequence of the emergence of digitally enabled healthcare platforms is the growing ability to understand all the factors that affect individual health — not just physiological factors, but the behavior of patients, their social systems, and the quality of nearby environments. Data about these factors is being accessed and analyzed across geographies, industries, and institutional boundaries, so that previously unseen interrelationships are revealed and recognized.

In South Texas, for example, where diabetes is prevalent, significant barriers have prevented people from obtaining quality care. A current project at the University of Texas (conducted in collaboration with PwC) is seeking to bring more digitally and socially connected care to this region. The project leaders learned that those who have diabetes are unlikely to schedule a visit with their doctor. Instead, they turn for support to relatives and close friends, and to social groups such as their church or community centers. Through partnerships with retail-
Bionic transformation turns every company’s business strategy on its head. It leads a company to reinvent what it does and who it benefits.

ers and community programs, the project set up screening and prevention programs in convenient and affordable locations. The data from these screenings is captured, tracked, and combined with available medical records from clinics and hospitals. Individuals can assess their health status on a mobile app, check their blood glucose and measure their blood pressure in nearby retail stores, and attend community-based lifestyle management classes — all while being supported by an expanded care team engaging them virtually to help them better control their disease. These seemingly small efforts gain power because they are interconnected: Together, they represent a step change in life management for anyone affected by diabetes.

Healthcare is only one of many industries undergoing major bionic change. In 2018, Amazon began partnering with General Motors and Volvo, both of which have proprietary electronic communications systems (called OnStar and On Call, respectively), to arrange package deliveries to cars. A car’s trunk is unlocked using a cloud-based verification protocol shared by the two companies, so the goods can be placed inside without the driver having to be present. Innovative banks deliver financial services from other institutions to their customers; universities without walls offer courses for credit from instructors around the world; and leading-edge supply chains combine 3D printing and comprehensive logistics to generate and deliver specialized products, continually accumulating process data to cut costs and improve the quality of everything they do.

Bionic transformation turns every company’s business strategy on its head.
It leads a company to reinvent what it does and who it benefits. Walmart is a good example. For years, it applied technology effectively to continuously improve its supply chain and drive down unit costs, attracting customers through low prices without much attention to shopper experience. Then Amazon and other online competitors reinvented the shopper experience: no physical store, access to insight from fellow customers, delivery to the shopper’s door, and easy returns. Walmart is responding to Amazon’s innovations with its own bionic transformation: Through the acquisitions of Jet.com (2016), Bonobos (2017), Flipkart (2018), and other online retail businesses; a partnership with Microsoft to develop a cloud computing–based retail platform; and experimentation with new businesses such as primary care clinics, Walmart is reinventing its identity from an everyday low-cost superstore to a center for managing one’s life.

How can your company begin a similar transition? Focus on three shifts of behavior: from supply-oriented to demand-oriented marketing, from knowledge stocks to flows in your R&D, and from head-to-head competition to a platform-oriented mind-set, in which one or two companies dominate.

Supply to Demand
Conventional shopping — at a department store or grocery, for example — is designed to optimize supply. Business leaders evaluate their opportunities by estimating the size of the addressable market for their products and services. How many potential customers exist, strategic analysts ask, and how much of this
market can our company grab? They then seek distributors, retailers, and marketers that can attract the consumer to their wares. But this approach constrains a company to the customers who want its portfolio of offerings — a market which is, by definition, limited in size.

Bionic companies feel no such market constraint. Instead, they ask a more ambitious question: What markets do we want to create? They create demand by changing the boundaries of existing markets or creating new markets of their own.

Take Stitch Fix, an apparel aggregator founded in 2011, and marketed as an online shopping service (though it could also be seen as a new type of retail store). Customers fill out a style profile, and algorithms are designed to emulate a stylist and pick a selection of clothing, shoes, and accessories tailored to the individual’s preferences. As S+B technology columnist Kevin Maney has pointed out, “AI and data make it possible to create a personal relationship without there actually being [a person] — which is what allows the concept to scale.” In addition, the concept reframes the experience of shopping. People’s bedrooms become, in effect, the fitting room; they keep what they want and return the rest in the seller’s prepaid package.

This business model can work only for a bionic company. As Stitch Fix CEO Katrina Lake put it in a 2018 Harvard Business Review article, “Data science isn’t woven into our culture; it is our culture. We started with it at the heart of the business, rather than adding it to a traditional organizational structure, and built the company’s algorithms around our clients and their
needs…. Stitch Fix wouldn’t exist without data science. It’s that simple.” The company makes a point of featuring its team of 80 data scientists, whose leader, chief algorithms officer Eric Colson, is a Netflix alumnus reporting directly to Lake.

What Lake calls “data science” is what we call behavior capital: wealth in the form of steadily accumulating insight about what customers want to buy. The system fine-tunes its selections based on its ever-expanding use of machine learning (an example of cognitive capital). Stitch Fix does not have to purchase items on the basis of estimates of what will sell. It can purchase items on the basis of what it calculates its customers will ask for next. The organization of its value chain is not based on factories and warehouses (although it has both in its system); the center point is the proprietary engine that matches clothing to prospective consumer, aligning company identity and individual identity.

In effect, the bionic age has changed the relationship between supply and demand. Ellen Levy, the managing director of the network capital–building firm Silicon Valley Connect, notes that consumers used to have to organize themselves around the supplier’s operations. In the future, the fulcrum of a shopping transaction will be demand; the supplier will increasingly have to organize around the customer. The more opportunities people get, the more easily and rapidly they will shift the nature of demand, and thus open the door to new businesses. One of the best-known examples is shared-ride services. When the first such service, Uber, opened for business in San Francisco in 2010, the city
had a $100 million taxi market. Nearly a decade later, the variable transporta-
tion business in San Francisco is a $300 million market. Did the population of
San Francisco triple? It may seem that way to longtime residents, but it’s grown
by only about 10 percent since 2009. What changed in San Francisco — and
a host of other cities — was the experience of getting a ride. The way in which
ride-sharing companies utilized behavior, cognitive, and network capital allowed
them to deliver a user experience that blew open the demand structure of the
taxi market and brought in new ventures.

More recently, app-based ride-sharing services for taxis, such as Curb, have
expanded their services and scope. They allow riders to summon conventional
cabs and pay their fares with smartphones. Other transit apps have similarly im-
proved the user experience for mass transit and auto rentals. Ultimately, some
interoperable demand-based platform could merge all these together, helping
people get around cities and suburbs seamlessly, paying one fare to use whatever
form of transportation is available.

**From Knowledge Stocks to Flows**

Traditionally, knowledge has been an asset that companies held close. But the
new forms of capital enable companies to deploy knowledge in a more fluid way.
Knowledge stocks can be unlocked and freely shared, and counterintuitively,
this flow of shared information (drawing on the company’s network capital) can
become an appreciating, self-renewing asset.

GitHub is a company of about 800 employees that is based on nothing
but knowledge flows. It hosts the world’s largest open software platform, which has attracted more than 28 million developers, who are working on nearly 50 million projects on any given day. In June 2018, a decade after GitHub’s founding, Microsoft announced that it was acquiring the company for $7.5 billion in stock. “Developers are the builders of this new era, writing the world’s code. And GitHub is their home,” explained Microsoft CEO Satya Nadella in a blog post. This represented a reversal for Microsoft. For decades, it had operated as a knowledge stock company and its leaders considered the open source software movement anathema. This acquisition made clear the extent to which knowledge flows, not stocks, will drive innovation in the tech industry in the future.

Knowledge flows are a key element in transformational visions that are aimed at solving complex problems. In August 2018, for instance, Amazon, Google, IBM, Microsoft, Oracle, and Salesforce announced that they would adopt common standards when building healthcare products to make it easier for companies to share medical data. That will enhance the ability of medical professionals to use data in their efforts to diagnose and treat patients, as well as create the kinds of free-flowing data streams needed to put artificial intelligence and machine learning to work in healthcare. Collaborative healthcare environments, such as DoubleJump Health, will coordinate the flow of information among organizations in a way that accentuates communication while managing privacy and other legal and ethical issues.

**Winner Take All**

Traditionally, companies have tried to define a competitive market position that they can occupy and defend profitably. This approach has required a loyal group of customers and a relatively stable competitive landscape. Now, the new forms of capital have shifted the basis of competition. Platforms are transformational greenfields in which companies can stake new claims. Those that stake a claim successfully — either by being first or by having a distinctive
value proposition that overtakes early rivals — become dominant players. They allow others to survive as dependent enterprises.

New economic research from PwC confirms that this dynamic does, indeed, happen when the computability of an industry rises far enough. The Corporate Gini Index is a barometer of a competitive landscape. In other words, it measures the strength of the all-or-nothing force in an industry. The higher an industry’s index score, the more dominant a few players are within it.

In those industries in which digitization has had the greatest effect, the Gini Index tends to be high. The correlation is related to the widely observed phenomenon that the nature of competition has changed in many industries as computability increased. In a growing number of sectors, one industry winner, maybe two, and occasionally three are increasing the gap between themselves and the rest of the pack. There is only one Apple, one Alphabet (Google), and one Amazon. Large competitors may arise (such as Microsoft or Walmart), but their value propositions are different enough that they each carve out their own slice of the competitive landscape, not fighting for the same core customers. To be sure, there are exceptions. In the field of home entertainment, a multifaceted competition rages among Netflix, Hulu, Amazon, Apple iTunes, HBO, and the video platforms of various television networks. In oil and gas, and in banking, there are multiple competitors. However, it’s hard to imagine that all of these companies will survive the evolution of their industry in their current form. The phrase “winner take all” may not be literally accurate in some industries, but it suggests the direction in which each industry is moving.

Technology-related industries, as one might expect, have had a head start in winner-take-all consolidation. Of the seven industries with the highest Gini Index, five are in the technology, media, and telecommunications arena. They are technology hardware (including storage and peripherals), telecommunications, consumer electronics, Internet and direct marketing retail, and systems software.

But other industries are catching up fast. In 2017, industries with high Gini scores included such nondigital categories as tobacco manufacturers, food distributors, soft drink purveyors, food retail, home furnishings companies, and makers of heavy electrical equipment. And more than half of the cross-industry
rise between 2006 and 2017 occurred in the final year alone. A growing number of industries have seen just one company capture a majority of the sector’s growth in enterprise value over the past decade. All of this suggests that the winner-take-all style of consolidation is accelerating, perhaps driven by digital network platforms as they spread across industries beyond technology and telecommunications. If that’s true, then the nature of competitive advantage will not return to multifaceted competition.

**Toward a Bionic Future**

These concepts — the three new forms of capital, plus organizing around demand, using knowledge flows, and a winner-take-all position — can help you develop a strategic identity for your company. For many companies, that’s the first step of a successful transformation (see “The Four Building Blocks of Transformation,” by Al Kent, David Lancefield, and Kevin Reilly, *s+b*, Oct. 22, 2018).

For example, you might reorganize your company around behavior capital, as Stitch Fix does, so that you gain distinctive and keen insight into your customers. You might develop new forms of cognitive capital specific to your business — for instance, your own digital twin that represents your operations and the risks you are considering. You might base your business on shared information, using network capital to expand in ways that purely financial investment would not cover.

Learn to compete on your bionic competence. Look for new metrics that
portray these types of capital, or make significant changes to your existing measures to value them. Currently, conventional business measures are leading most companies astray: Such measures undervalue the relationships and connectivity a company has built (network capital) or the insights into human activity captured in its decision making (behavior capital), or the routines and automation that are more effectively deployed at your company than anywhere else (cognitive capital).

In the end, the critical factor is the imagination of you and your colleagues. The transformation of business is just beginning. Today’s unicorns have no monopoly on bionic practices. Indeed, many powerful bionic practices, making full use of behavior, cognitive, and network capital, have yet to be developed. You can’t know in advance whether you’ll come out on top in a winner-take-all competitive environment, but you can be sure that with the right kinds of capital in play, you have a far greater chance to thrive.

**Resources**


