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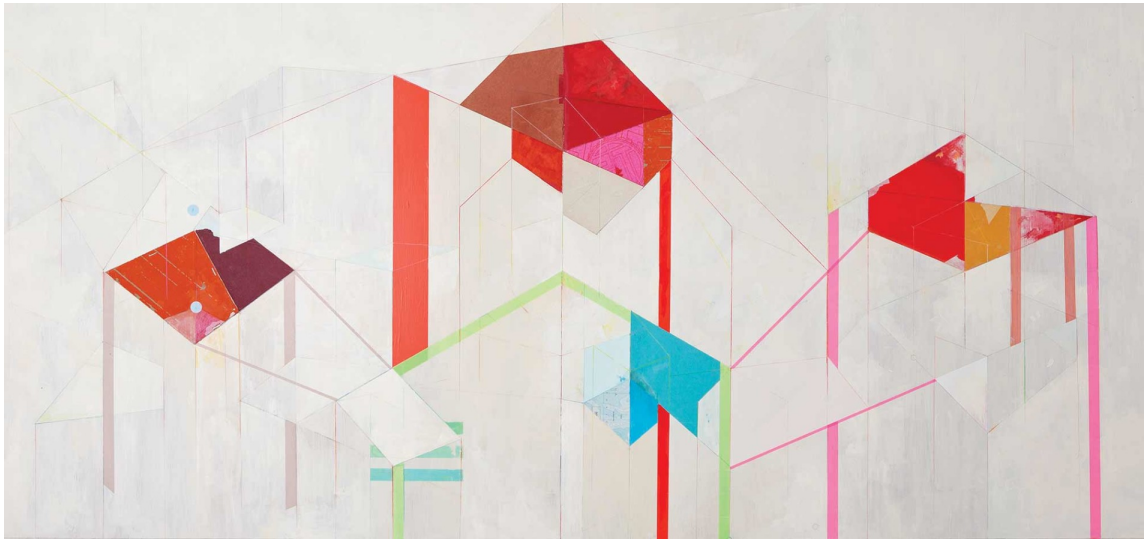

DATA

The Problem with Legacy Ecosystems

by Maxwell Wessel, Aaron Levie, and Robert Siegel

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As automation and digitization transform the economy, well-resourced incumbents in industry after industry are losing out to upstarts. Traditional retailers that have entered the e-commerce space appear no match for digital-native Amazon. Electric-vehicle sales at the world's most storied automotive companies consistently trail Tesla's. And even after substantial investments in technology, no taxicab consortium has been able to fend off Uber's attack.

Why is it that so few of the powerhouses of the 20th century are leaders in the new data-driven world?

The three of us have been exploring that question in a course called "The Industrialist's Dilemma" that we teach at Stanford University's Graduate School of Business. Part of the answer has already been suggested by Clayton Christensen and other business scholars. All companies' internal systems—their metrics, resource allocation processes, incentives, approaches to

recruitment and promotion, and investment strategies—are set up to support their existing business models. These systems are generally well established and extremely difficult to change, and they often conflict with the needs of digital business models.

But the CEOs we interview in the classroom pinpoint a different challenge—one that arises because of how value is created in a digitized economy. Many of the most successful business models of the 21st century are built on being able to reach into peoples' lives, using software that generates information on customer habits and patterns of usage. These digital relationships provide a new level of intimacy, allowing firms to personalize their offerings and better orchestrate how they serve customers.

Most older companies, however, struggle to take advantage of the opportunity to extend their relationships with customers, because they're constrained by their existing value chains. A network of partners with fixed ways of doing business presents an *external* challenge, even if the *internal* challenges that go along with business model reinvention can be overcome.

Firms that have had relatively stable relationships with suppliers, competitors, collaborators, and customers for many years can't easily shake up those networks. But doing so may be essential for long-term survival. To better understand why, let's take a deeper look at ways in which the digital era has changed how we create and capture value.

Software Transforms Customer Relationships

Uber's success is not a story about big data. It's a story about small data obtained directly from customers in a new way. Uber realized that it didn't need to amass and analyze vast amounts of information about taxi usage; it simply had to capture the most meaningful piece of information about users at exactly the right time: *where* a potential rider is located *when* he or she needs a ride. And the company knew it could learn that if it had access to the customer's cell phone. Afforded such access, Uber could make a rider's experience easier and more convenient than taxicabs did.

Many of today's most iconic companies share a similar story: Their success is built on an ability to reach further into a customer's world than competitors do (or than anyone could have 20 years ago). The clearest examples are in the realm of connected devices. Tesla equips its cars with sensors and software to understand how customers drive and to offer them autopilot functions. Nest sells "smart" thermostats, smoke detectors, and video cameras that keep tabs on what's

happening in users' homes in order to improve energy efficiency and safety. General Electric is reaching into its customers' industrial sites to monitor assets in real time, providing service alerts and changing maintenance schedules according to data gleaned from embedded software.

But it is not just connected products that enable companies to extend their relationships with customers. Consider Netflix: By instrumenting its apps to detect everything from where customers are geographically to when viewers stop watching a movie, the company is able to understand people's preferences intimately. The streaming-media giant uses this knowledge to provide timely recommendations and to source—or even create—content that people will love.

23andMe, a provider of genetic testing, also takes customer relations to a new level. Instead of simply sending test results to doctors and hospitals, as most labs do, 23andMe maintains a connection with clients, periodically sending them questionnaires, creating a community through online forums, and pointing people to relevant information about their health and genetics. Such ongoing engagement allows 23andMe to conduct innovative research while spending far less than competitors and continually gaining insights to share with clients.

The ability to connect more personally with customers creates immense opportunity for companies to capture data about the market, supply new products and services, and build extremely defensible network effects and feedback loops. But transforming a customer relationship is not simple; it often requires doing things differently up and down the value chain.

Disrupting Partnerships

Most corporate strategists fail to grasp that software alone won't transform their business model. Each of the aforementioned companies leverages software in innovative ways, but each also changed how products are distributed and serviced—and even how input materials are sourced.

Let's return to the example of Nest. Cofounder Tony Fadell told our class that an early differentiator for the company was that it chose to market its first product, the Learning Thermostat, directly to homeowners for do-it-yourself setup, bypassing the typical distribution and installation channel—professional contractors. Why does that matter? Nest's team knew that only a small fraction of thermostats were ever programmed to adjust a dwelling's temperature depending on the time of day, the day of the week, and the season—the process was just too complicated. To deliver on the promise of a thermostat that would actually program itself, Nest had to enable the device to learn the customer's temperature preferences and schedule. And for

the software to work best, the team needed to create user profiles, ensure that the thermostat was connected to a home's wireless network, and confirm that the customer had the Nest mobile app on his or her phone.

Approaching product sales and installation differently made this possible. Without contractors in the supply chain, Nest could develop a user-friendly product from which customers could easily derive value. The company's decision to abandon the traditional distribution channel committed the team to building a strong retail strategy and a consumer-facing brand. But it disadvantaged professional installers and challenged the existing ecosystem.

As the case of Nest shows, when companies use digital technologies to form new relationships with customers, software development is only part of the process. Sometimes this is because companies seek to change customers' behavior at various points in the customer journey. Sometimes it is because delivering value involves using the data collected to supplant former partners. In either situation, business models and channel strategies must change in unison—requiring tough decisions that can upset long-standing partners.

The Need for Interdependence

In some circumstances, the shift from an industrial to a digital setting has even more radical consequences for partnerships than what we saw in the Nest example.

To understand why, we need to take a brief detour, to look at what scholars understand about how transformative innovations emerge and evolve. Clayton Christensen, drawing on the work of Alfred Chandler and other business historians, has observed that the need to restructure the extended value chain is common when major innovations are introduced—not just because business models are often in flux, but also because innovative product designs are still emerging. Early in the life of a new product, the inventors don't have a deep understanding of how to optimize different components of an innovation relative to one another. The first automobile manufacturers, for example, needed to maintain tight control over research, design, and manufacturing. Changes to one part of the car often meant changes throughout the automobile. For that reason, product development required an *interdependent* network of partners.

Over time, as more standard design architectures emerged, companies developed a sophisticated understanding of how the different components worked together—how transmissions relate to batteries, for instance, and how batteries relate to electrical systems. Components and

subsystems could then be *modularized*. Today traditional automobile manufacturers have the luxury of allowing innovation to occur at the subsystem level; next-generation products will plug in easily to most car platforms. Such broad scope for independent partner activity is typical of mature technologies and mature industries.

What's Different About Today's Information Technology?

Far more born-digital companies replace incumbents now than was the case a generation ago. That's because the nature of IT innovation has changed in fundamental ways.

In the 1990s most IT inventions (and investments) were designed to support large organizations' internal processes. Businesses like SAP, Oracle, and IBM were all about helping corporations operate more efficiently. At the time, infrastructure and applications were expensive and inflexible. It was easier to focus on automating processes than on disrupting how client businesses made their money. For those reasons, the first generation of IT benefited large organizations more often than not (although the displacement of employees caused some pain).

Today incredible improvements in the price and flexibility of IT infrastructure have aided newcomers across industries, enabling them to use technology to create businesses with operating models entirely different from those of their 20th-century peers. Further, the spread of the internet into our homes and onto our mobile devices has made it easier for digital innovators to reach customers directly. These innovators seek to *displace* rather than *support* legacy organizations—making it critical that older businesses pay close attention to what's changing and adapt when necessary.

However, the more dramatic the innovation, the more interdependence may be required. As we find our way into a world of autonomous and electric vehicles, a level of interdependence that resembles vertical integration seems needed again. Tesla's cars maintain some of the most interdependent architectures on the market. The automaker controls every component of its vehicles, including the hardware, the software that manages the complex electrical system, and the algorithms and sensors that enable the self-driving functions. And the tight control extends even further: Tesla owns its distribution channel, service network, and charging network. This integrated model allows the company to address all the challenges involved in producing autonomous and long-distance electric vehicles, along with fast-charging batteries. (There's a drawback, though—the model also creates operational complexity that might slow the company's expansion.)

Building a New Ecosystem

Let's assume we accept the first two points in this discussion—that advances in computing and communication allow businesses to extend their relationships with customers, and that taking advantage of these digital technologies requires companies to create a more interdependent architecture for the innovation. Then the implications become clear: Companies of all varieties will need to reshape their value chains. And sometimes this change will impact longtime partners in unfavorable ways.

Netflix, as we mentioned earlier, monitors everything its customers do and uses that information to power decisions ranging from content recommendations to content sourcing. But to do this effectively, it needed new ecosystem partners with compatible goals: content owners looking for "long tail syndication" (like the BBC), distribution vendors (like Amazon Web Services), and platform partners that would enable the instrumentation of applications (like Apple and Google).

Sometimes existing partners are eager to reinvent themselves. Sometimes they can be financially motivated to adapt to a company's new needs. But just as often, they have business models that are too difficult to change. Waiting hopefully for partners to catch up can jeopardize the long-term viability of a business. There's no easy way to manage the transition from one business model to another, but over the past year, we have observed a handful of best practices among the companies most successfully navigating this environment.

Establish what you *must* do.

We've heard again and again from senior leaders about the importance of understanding what is needed to deliver value to their customers over the long run.

Reasonable people may argue about what the world will look like in the near term—or even the medium term. Fortunately, most rational executives *can* agree on the macro trends that will affect their industries over an extended period. By extrapolating from those trends, it's possible to come up with a thesis about how customers will consume products in the future. Deciding on the company's next steps may not be easy, but agreeing on the long-term predictions for the industry, the role the company can play under those scenarios, and the likely role of your partners is the way to begin making the necessary changes to take advantage of digital.

Consider one of the most prominent examples of digital transformation: General Electric. In 2008, when the company's senior executives met to discuss their long-term vision for the company, they all agreed that industrial machines would soon be affected by the internet. They

also agreed that once industrial assets were connected, the software could easily become the most differentiated part of a machine's offering, in much the same way that it had with personal computers. The timeline was open to question, but focusing on this inevitable change in industrial operations gave GE a polestar. It allowed the company to clearly outline expectations for employees and partners, and even to guide customers. For instance, the expectation that a singular data platform would be necessary to unify a company's industrial assets pointed GE to a future where it would provide software directly to customers instead of relying on system integrators to deliver it in a piecemeal fashion. Such clarity about what lay ahead also prompted company executives to continually question whether the decisions they were making were in the organization's long-term interest.

Why You Can't Afford to Fall Behind

Some managers acknowledge the value of digital opportunities, but they want to know which attempts will succeed before they invest in projects that might upset existing operations or irritate channel partners. Unfortunately, taking a "wait and see" approach can be disastrous, because businesses that make data a core asset can build early and insurmountable leads. Those first-mover advantages exist because data has three beneficial characteristics:

Data is scalable.

In the 20th century, delivering value to customers across the globe was difficult. Consider the hurdles Procter & Gamble faced in selling soap. Developing sufficient production capacity cost huge amounts. Setting up a global distribution network required mastery of complex operations. And hiring, training, and supervising a geographically diverse network of employees was enormously difficult. Today those processes are easier, but production is not infinitely

As business leaders everywhere start to deal with the pressures that digital change can bring, establishing some type of polestar is invaluable. If you know the direction in which you must move, it's much easier to decide when it's critical to disrupt your partners' legacy ways of doing business.

Develop better metrics.

For many of the world's most successful businesses, the gauges of success have been in place for decades. Often these metrics—whether they're directed at internal employees or at external partners—focus on profitability or top-line revenue. Such output-based metrics are wonderful for mature businesses but less relevant in situations of digital innovation. A key factor in managing digital transformation is changing performance metrics to better highlight the failures of status quo operations and to support risk taking and experimentation.

Consider Ford Motor Company. When Mark Fields, Ford's CEO, joined one of our recent class sessions, students repeatedly asked about the

scalable, distribution networks still need to be built, and managing a global workforce remains a challenge.

For digital businesses, however, offerings scale easily and cheaply. With some minor investments in language localization, software can extend immediately to any corner of the globe. Once an initial investment has been made in harvesting data and building the software system, it's possible to service customers anywhere at no incremental cost. That scalability alone is a game changer.

Data is defensible.

In an era of industrial production, it was often possible to learn your competitor's secrets. If a business had a proprietary production process, for example, a competitor could hire away a senior engineer. Data-intensive businesses, however, are inherently easier to defend. In the case of General Electric, for example, the company's maintenance software leverages trillions of data points to make predictions about future performance. No single person could possibly memorize the data or the rules that govern the system. Although someone might be able to replicate the prediction algorithm, without the petabytes of training data it would be impossible to deliver the same value to customers.

Data is reinforceable.

For a company such as Netflix, which has been monitoring the likes and dislikes of customers for years, it's easy to build a basic recommendations algorithm. But Netflix's algorithm would not be impressive if it had stopped at iteration number one. Instead the company continually monitors what movies it recommends within categories and how

risks automotive manufacturers face with autonomous vehicles. Fields acknowledged that the topic is a big one at Ford. Executives want to be ready to embrace new service and distribution paradigms that driverless cars might enable (paradigms that might upset a network of legacy partners). To that end, Ford has moved away from assessing executive performance largely on the basis of units sold annually; the company now also factors in the miles that are driven in Ford vehicles. Whether the company sells more new cars (the traditional measure of business performance) or increases the lifespan of existing vehicles (a metric that benefits few in the ecosystem beyond car owners), Ford executives will still be delivering toward their goals.

When the metrics change significantly, they can highlight and reinforce behavior that supports a company's digital strategy. As an example, Kaiser Permanente now pays less attention to common metrics such as hospital and doctor utilization within its network; instead it's focusing on maximizing "healthy life years" for patients. The emphasis on this new metric is helping the organization prioritize partnerships with wellness and technology companies over the hiring and optimal deployment of medical personnel.

Create commercial opportunities for partners.

It's not possible to avoid adversely affecting some of your ecosystem partners. HBO might have to go around a cable company's set-top box

people react. It uses the new information generated—whether a prediction was right or wrong—to augment and update the software. Over time, with each prediction, Netflix is able to grow its data set and deliver ever-greater value to customers. Many information-enriched services share this characteristic of constantly improving with incremental use.

and deliver apps directly to consumers. Chanel might have to build digital storefronts that threaten generations-old retail partners. General Electric or Siemens might offer software that competes directly with products from IBM, Accenture, and PTC. But as Patrick Collison, the CEO of the payments company Stripe, pointed out to our students, digital is not a zero-sum game. Stripe has been successful at partnering with existing financial institutions across the industry. Why? Because by decreasing the friction associated with building digital payment solutions, Stripe can help drive far more transaction volume through its partner institutions even while claiming its own small share of the market.

Where possible, it's vital for firms to create new opportunities for both themselves and their partners. As the overall economic pie gets bigger, firms can offer more—albeit smaller—pieces to others in the value chain. So while Accenture or A.T. Kearney might lose some systems integration revenue as GE starts delivering more standard software, GE makes a point of suggesting how everyone can benefit economically from this new way of doing business. For example, GE Digital's CTO, Harel Kodesh, regularly speaks with stakeholders about what the company is focused on and where it hopes partners like Accenture and A.T. Kearney can create applications.

Similarly, Kaiser Permanente is putting incentives in place to drive innovation in telemedicine. Visa is offering fraud-detection algorithms to affiliated developers. Whatever your business, creating commercial opportunity for your partners is a powerful tool in helping them embrace your vision.

CONCLUSION

Establishing a polestar, changing performance metrics, and creating opportunities for partners can make it easier for industrial-era companies to manage the change to new, digital-enabled business models. But we don't mean to suggest that these transformations will be straightforward or pain-free. Companies will have to make difficult decisions that leave members of their legacy ecosystems behind. Some partners will necessarily turn into competitors. Others

may simply become obsolete. But if business leaders can acknowledge that digital requires changes beyond software—and often beyond the direct control of their business—the opportunities are enormous.

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Paramjeet Sachdev 8 days ago

Thanks for the great article. It resonated with me in many ways.
I think Doug Garnett's comment about disruptive data driven value is only partly true. While there is most definitely a lot of hype and over expectation around digital transformation and data driven decision making there is also a lot of value, if delivered correctly. By correctly I mean if it has been driven from a commercial angle rather than a science project.
I also disagree with Doug's comments about Amazon and their recommendations. Unfortunately for my wallet, their recommendation have been pretty accurate, and a reinvestment of their profits in their business for strategic growth seems like a great business plan to me.

This may not come as a surprise, but I also disagree with Doug's comments regarding Tesla. They had the foresight and the energy to drive forward with the Electric revolution, at the expense of traditional manufacturers who are lumbered with a legacy ecosystem that may not survive the next 10-20 years. Tesla have had a master plan and Phase 3 has recently been announced with the release of the Model 3. Regardless of what the existing manufacturers do with electric cars in the near future, Tesla have created a brand that is synonymous with cool electric cars, not dissimilar with what Steve Jobs did at Apple. I see profits coming Tesla's way in the near future.

I don't understand why we would lambaste an organisation for digital innovation if profits are not immediate. Of course it's a business and profits are the end-goal but to disrupt well established markets and incumbents is no easy task. There are many examples across many industries where the combination of enhanced data, IT, and business processes combined have reaped huge rewards for the innovators and helped to decimate existing conglomerates.

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