

The Digital Business Divide

Analyzing the operating impact of digital
transformation

Marco Iansiti

David Sarnoff Professor of Business Administration, Harvard Business School

Karim Lakhani

Professor of Business Administration, Harvard Business School

Note: the authors have consulted for a number of companies in the software industry, included several mentioned in this paper. Funding from Microsoft Corporation contributed to the empirical research quoted in this work. All research was conducted independently.



“The future is so much bigger than the past”

Tim Berners Lee

Our economy is undergoing deep transformation. The cause is the new ubiquity of digital technology, which is transforming and reconstructing business strategies, processes and operating tasks. The implications are profound and reach across all industries, launching not only waves of disruption and dislocation, but also opportunity.

In just a few years, digital technology has connected an ever-growing number of people, sensors and devices, created new business and social networks and ecosystems and transformed our economy. From mobile payment networks in central Africa to virtual reality environments envisioned in Silicon Valley digital technology is reshaping business and social interactions. Moreover, the rate of change is not decreasing. Ten years from now, our economy will draw from more than one thousand times the aggregate computing power that is available today. More powerful, and even more connected, digital technology will continue to drive social and economic change, and do so at an even greater rate than we witnessed over the last ten years. Our economy is now on Moore’s law and digital transformation has become the new normal.

Not all organizations have responded in the same way. While some have invested significantly in technology, operational and cultural changes, others have lagged behind. Our research shows that a substantial performance gap is opening between digital leaders and laggards, effectively creating a “digital divide” across companies. While many are benefitting from the new range of capabilities and opportunities created by digitization, others appear to be falling behind.

Researching Digital Transformation

This paper draws from more than a decade of research on the digital transformation of our economy. While some studies focused on new, “digital native” companies like Uber and Facebook, other studies examined digital transformation challenges and opportunities in traditional industrial sectors. The work combined the input of dozens of researchers and involved the collaboration of several Harvard Business School faculty associated with the HBS Digital Initiative. Overall, we studied hundreds of companies through both qualitative, case study methods as well as analytical surveys.

The most recent (and extensive) research project is founded on a collaboration with Keystone Strategy LLC, funded in part by Microsoft Corporation, and focused on the impact of data and analytics on company’s business and operating models. We conducted 344 one-hour long telephone interviews with senior business and technology decision makers to profile the technologies enterprises have deployed and assess the business and technical capabilities in place to manage, analyze, and apply insights from the data they collect. This research focused on upper midmarket and enterprise organizations, with a median company size of over 6000 employees and \$3.4B in company revenue. Organizations represented include most major companies in the Manufacturing, Consumer Packaged Goods, Financial Services, and Retail industry verticals.

Digital Transformation and Performance

Our research shows that digital transformation not only provides a challenge for managers, but also defines a major opportunity - investment in digitizing your business appears to pay. Our empirical observations show that digitally transformed organizations (“digital leaders”) performed much better than organizations that lagged behind (“digital laggards”).

The table below shows how organizations that scored in the top quartile of our digital transformation index obtained much better gross margins as well as better earnings and net income than organizations in the bottom digital quartile. Other financial and operating indicators showed similar disparities.

Performance Metric	Digital Laggards <i>(Bottom 25% of enterprises)</i>	Digital Leaders <i>(Top 25% of enterprises)</i>
Three Year Average Gross Margin¹	37%	55%
Three Year Average Earnings before Taxes	11%	16%
Three Year Average Net Income	7%	11%

Our research also shows that a digital advantage is not simply a function of spending money - the best performing companies stated they have technology budgets on par with digital laggards. Clearly, building capability in digital transformation involves some significant capability building.

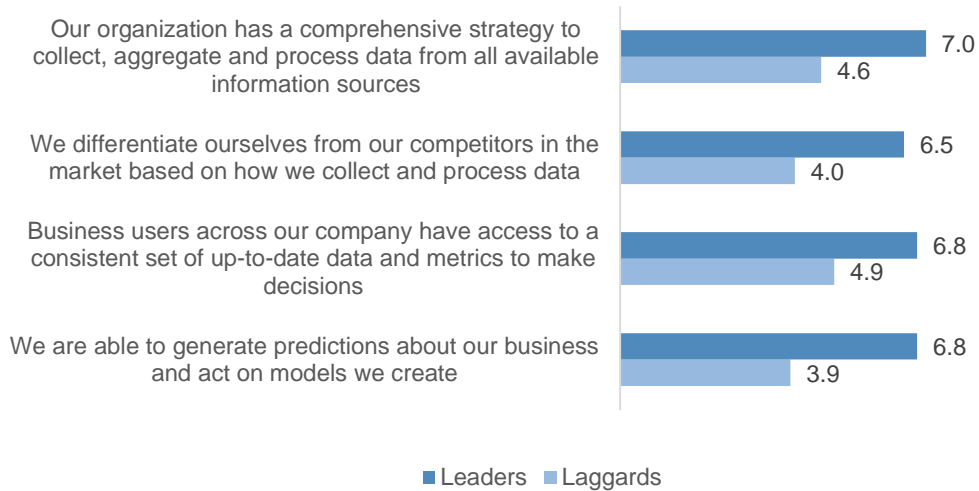
	Digital Laggards <i>(Bottom 25% of enterprises)</i>	Digital Leaders <i>(Top 25% of enterprises)</i>
Average IT Spend as a Percentage of Revenue²	3.2%	3.5%

What accounts for these differences? Our research indicates that the leaders approach the digital opportunity with a different strategic mindset and execute on the opportunity with a different operating model. The chart below, for example, shows how enterprises view the use of technology to process, store and analyze data in starkly different terms. Leading organizations are more likely to state that they have a comprehensive data acquisition strategy and differentiate themselves from competitors based on their data platform. This difference in strategy means that business users are more likely to have access to a consistent set of up-to-date metrics for decision making and the organization is able to generate predictions about their business from data they collect.

¹ Keystone Strategy interviews completed between October 2015 to March 2016. CapitalIQ; three year averages based on CY2012 - CY2014

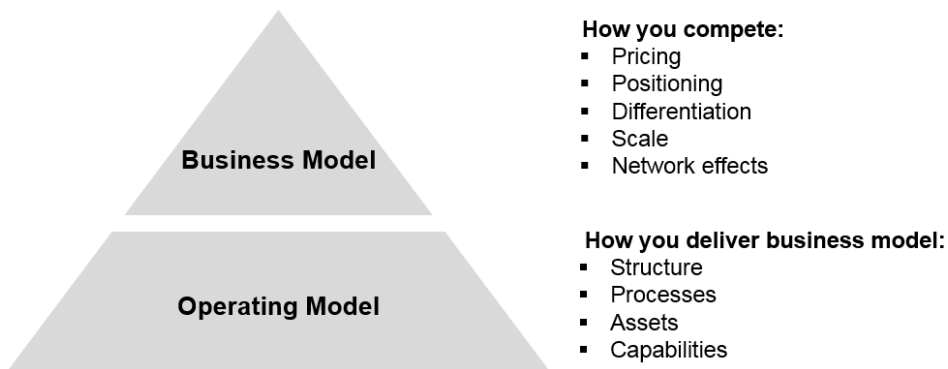
² Keystone Strategy interviews completed between October 2015 to March 2016. CapitalIQ. Average self-reported IT spend divided by three year average revenue (CY2012 – CY2014).

Please rate how well each statement aligns with your company's perspective regarding the role of Data & Analytics (10 point scale)



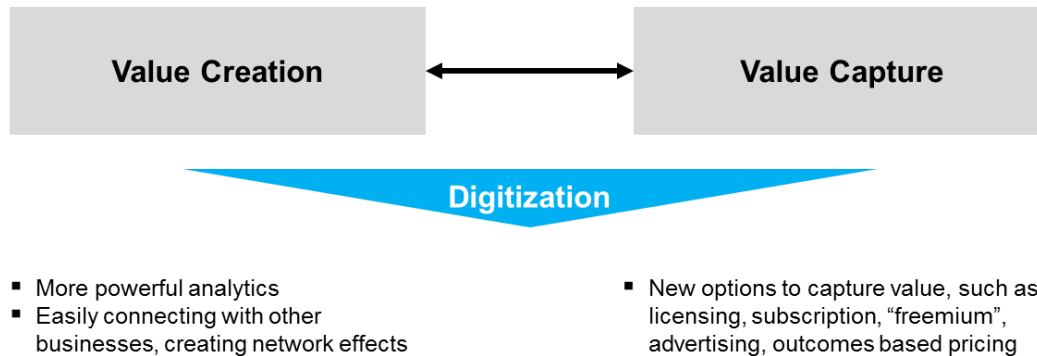
The 21st Century Operating Manager

Ultimately, all managers make operating decisions: decisions that drive the planning and execution of the activities that translate strategy into action. Digitization is dramatically changing the nature, locus and speed of these decisions, as well as the technology, services and systems that enable effective and efficient operating performance.



The broad deployment of digital technology requires rethinking both business and operating models. A *business model* defines the direction taken by your organization – how it creates and captures value. An *operating model* defines how your organization makes it happen - delivers the value promised by its business model. In combination, business and operating models define and rank the range of options available to operating managers in making their daily business decisions.

Organization's Business Model and Impact of Digitization



First, digital technology changes the way an organization can create value – digital value creation stems from new, network centric ways your business connects with partners and customers offering new business combinations. Value is increasingly captured by new data, embedded and shared in your networks, with “network effects” driving an increase in value as the network expands. This means that business models are increasingly network centric and data oriented.

Examples of how everyday products are becoming digital and connected abound. Smart home thermostats like Google’s Nest and Honeywell’s Lyric are prime examples. These smart devices revolutionize everyday tasks allowing consumers can use their phones to adjust temperatures remotely and over time learn from consumer behavior to predict the right temperature settings. As the installed base of smart devices grows, the data set becomes richer and algorithms improve to make for a better user experience. These network effects extend to the business ecosystem surrounding the device. In much the same way that Apple and Android have raced to acquire developers to write for their smart phone platforms and differentiate their products in the market, Honeywell has opened up Lyric’s APIs, enabling an ecosystem of programmers to write applications and a richer user experience.³

Honeywell’s digital strategy is transforming the company from the ground up beyond just its competition with Nest in the home thermostat market. Honeywell recently established a dedicated Industrial IoT (IIoT) division to create an IoT platform that helps industrial clients derive greater value from its products and the 2.5 billion gigabytes of data the company captures each day.⁴ Within the core business, digital technologies are fundamentally changing the way Honeywell creates and captures value for its industrial customers through new efficiencies and services that unlock new value.

Second, opportunities for capturing the value an organization creates also expand greatly, with pricing technology, ubiquitous sensors and business instrumentation offering completely new ways to drive price differentiation, efficiency and accuracy. An increasing portion of the value captured is also

³ Honeywell launches API program to compete in the IoT market, Network World, <http://www.networkworld.com/article/3022443/internet-of-things/honeywell-launches-an-api-program-to-compete-in-the-iiot-market.html>.

⁴ Honeywell creates new division based on Internet of Things, Automation World (May 2, 2016), <http://www.automationworld.com/industrial-internet-things/honeywell-creates-new-division-based-internet-things>.

shared with partners, customers, and community participants as the locus of any business model expands to business networks and communities.

Automobile insurance companies like Allstate, Progressive and StateFarm have launched programs to use connected devices to monitor customers' driving patterns. Automotive telematics can be used by as many as 155 million cars in North America⁵ and can capture key metrics such as the frequency and length of trips and unsafe driving behaviors like hard braking and rapid acceleration. Insurers can use this data to better understand their customers and price policies accordingly. Safe drivers stand to benefit from lower premiums as traditional pricing policies are amended using real-world data about customer behavior.

Third, delivering the new business models is not simple and requires the adoption of new operating models. Adopting a digital approach to operations can change the very foundations of an organization. Digitization changes both the timescale and locus of an organization, the very nature of the way it explores new ground, experiments with new concepts, and delivers products and services to customers. Automobile makers like Ford and BMW are used to 2- to 4-year time scales to design and develop a new product - the Amazon website changes every 3 seconds. Cell phones at Nokia used to be designed by a closely integrated, highly secretive core team of ten to twenty people - there are now over *millions* of developers of mobile applications. Digital transformation can provide significant opportunities for leveraging old assets to create and capture value in new ways. But without adopting a new, digital operating model, the same assets will be stranded and old organizations will be on the way to irrelevance and displacement.

Ecolab is a prime example of how operating models are changing. A global leader in water treatment solutions, Ecolab's products and services help major refineries, petrochemical plants and manufacturing facilities process and save water in their operations.⁶ Increasingly, Ecolab's business is taking advantage of data it collects from its equipment to ensure greater uptime and performance, deliver enhanced customer service,⁷ and help customers achieve key business outcomes.

Ecolab's data platform has been designed to generate operational insights from a rich set of data from Ecolab's equipment and a profusion of networked sensors.⁸ Insights gleaned from this data has transformed Ecolab's field service operations.⁹ Ecolab can monitor its products to identify potential

⁵ Auto insurers are using the Internet of Things to monitor drivers and cut costs, Business Insider, <http://www.businessinsider.com/iot-is-changing-the-auto-insurance-industry-2015-8>.

⁶ <http://www.nalco.com/applications/water.htm>

⁷ "Our knowledgeable sales-and-service team has extensive visibility into our customers' operations, and our associates serve as trusted partners to identify and solve the operational challenges our customers face. The insight gained by our sales-and-service team is critical to our ability to develop and implement effective solutions." Ecolab Annual report 2015, p. 9, available at: <http://investor.ecolab.com/~media/Files/E/Ecolab-IR/Annual%20Reports/2015-annual-report.pdf>

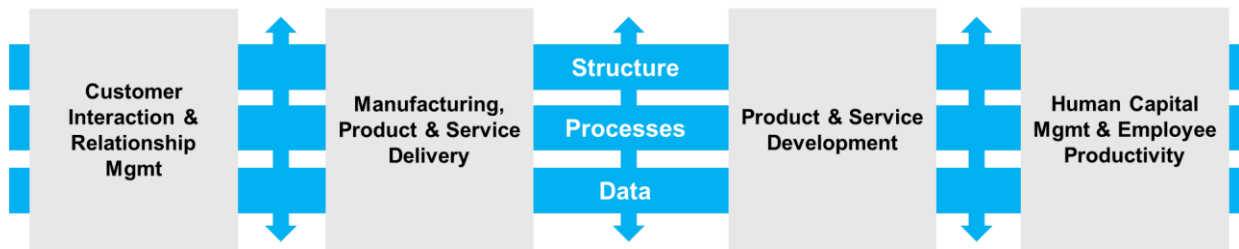
⁸ "There's another advantage to collecting so much data on a single data platform with the analytical power of the cloud: It helps establish operational benchmarks, by comparing millions of data points from common processes across thousands of plants and customers. With this information, the company will be able to identify ways to operate more effectively and efficiently"; <https://blogs.microsoft.com/transform/2016/04/04/ecolab-and-microsoft-team-to-face-water-shortage-challenges/#sm.001koe38wafieyq11um1udf7ejgrb>

⁹ "[Before establishing the data platform, it was] a highly manual process, but today, through the power of field service capabilities, and the intelligence of the systems, we are able to pass this data directly to the mobile service technician service device"; Video at 2:50 <http://immix.co.za/microsoft-technology-helping-ecolab-better-serve-customers/>

problems, suggest and dispatch the best available technician, and minimize downtime or process disruptions.¹⁰

Improving service management efficiency has only been a first step. Increasingly, Ecolab is using its growing network of equipment to generate new services for customers. Data can be aggregated to benchmark a customer's operations, suggest performance improvements, and help the customer capture greater value through energy and water savings, increased product performance. Using data, Ecolab is advancing its customers toward a goal of net-zero water use.¹¹

Digitizing the Operating Model: Data and analytics provide real time context to every business process and managerial decision



Four Operating Pillars

Delivering a digital business model requires building a digital operating model. Not surprisingly, this takes some significant work and investment. In a number of digital-native start-ups, the capability to respond and adapt to its changing environment is essentially inbred. In a more mature organization, the same capability is much harder to instill and requires a targeted, multi-year commitment.

Digital operations are built around four core pillars. The first is customer interaction and relationship management, which leverages new but extensive data and analytics platforms to shape relationships and target opportunities. The second is manufacturing, product and service delivery, which manages internal operations as well as the increasingly crucial and extended ecosystem of partners and external contributors. The third is product creation and delivery, which combines a tailored mix of engineering, product management, data sciences, traditional engineering ops, design and economics resources. The fourth is human capital management, which focuses on recruiting, developing and enabling information workers, providing the processes and systems to empower them with the tools required to connect and remain productive. Digital leaders have achieved more robust capabilities across all four operating model pillars, as shown in the following table.

¹⁰ <http://immix.co.za/microsoft-technology-helping-ecolab-better-serve-customers/>

¹¹ Christophe Beck, President, Nalco Water, an Ecolab company: “most importantly, <we> manage our customers’ process so that they can get closer to net-zero water usage”; <https://enterprise.microsoft.com/en-us/industries/process-manufacturing-and-resources/solving-global-water-challenges-with-microsoft-cloud-technologies/>

Operating Model Pillar	Profile of Digital Leaders Relative to Laggards
Customer Interaction & Relationship Management	<ul style="list-style-type: none"> ✓ 2.5x more likely to harness real-time data and analytics to deliver tailored customer experiences ✓ 2.5x more likely to use analytics to develop perceptual intelligence about customers ✓ 2.6x more likely to use analytics to prescribe business actions to limit customer churn
Manufacturing, Product & Service Delivery	<ul style="list-style-type: none"> ✓ 1.5x more likely to optimize production runs based on demand forecast ✓ 1.7x more likely to be able to predict equipment downtime using advanced analytics ✓ 2.3x more likely to use predictive modeling to anticipate customer support requests
Product & Service Development	<ul style="list-style-type: none"> ✓ 2.3x more likely to inform product design by capturing data on how their products are used ✓ 1.8x more likely to monitor products remotely and drive customers support based on data insights ✓ 1.9x more likely to use data to benchmark customers and advise them on how to realize greater value
Human Capital Management & Employee Productivity	<ul style="list-style-type: none"> ✓ 2.6x more likely to collect data on employee performance and generate recommendations for development ✓ 1.4x more likely to empower employees with access to self-service business intelligence and data visualization tools ✓ 1.7x more likely to allow employees to define and receive real-time alerts to more effectively manage changes to the business

The Journey

Driving digital transformation does not imply replacing old business assets and capabilities. In fact, digital transformation can give new life to components of an older business, effectively reconstructing business and operating models on top of digital foundations. Even Uber did not replace traditional limousine services. In fact, taxi and limousine service revenues have increased significantly in the last five years. Unlike earlier ideas about internet disruption, modern notions of digital transformation build on the older, analog world. But like any significant building addition, doing it well requires modifying the existing structure. There are no blank sheets of paper. Digital transformation is about reconstructing the firm around digital operating principles, integrating traditional assets with new opportunities.

The competitive implications are important. Digital-native companies like Google, Facebook and Uber are entering virtually every sector of our economy, looking for new value in sectors from energy to automotive, and from luxury goods to consumer electronics and entertainment. Millions of digital start-ups are being launched, experimenting with every business model on the planet, in industries

from apparel to space travel. At the same time, once traditional firms like GE, Ford, and Burberry's are reinventing their business models and investing billions in new digital infrastructure and capabilities.

The time for investing in digital transformation is now. Digital technology has been spawning networks for several decades, but the rate of transformation is increasing. In recent years, the number of connected devices has exploded. With an increasing variety of device types and form factors, as well as the rapid deployment of connected sensors (the "internet of things") digital connectivity has literally gone critical in the last couple of years, leading to a combinatorial explosion of business possibilities. Energy, consumer electronics, automotive, entertainment, banking, personal products and food services are all being connected by software networks. This is why Google is driving connected automobiles and thermostats, Facebook is driving telecommunications and virtual reality entertainment, Apple is introducing luxury watches, and GE is enabling a new industrial ecosystem.

This new landscape of business is creating major opportunities and challenges for everyone. At the core of every one of these is the fact that the very foundation of business value in our economy is shifting and is going to continue to shift. This changes both exploration and execution, both strategy and operating model. The changes are here to stay. Digital transformation has become the new normal.