Designing and Executing Digital Strategies

Completed Research Paper

Jeanne W. Ross
MIT Sloan CISR
Cambridge, MA 02142
jross@mit.edu

Ina M. Sebastian
MIT Sloan CISR
Cambridge, MA 02142
isebasti@mit.edu

Cynthia Beath
University of Texas at Austin
Austin, TX 78712
cbeath@mail.utexas.edu

Martin Mocker
MIT Sloan CISR, and
Reutlingen University
72762 Reutlingen Germany
martin.mocker@reutlingen-
university.de

Kate G. Moloney
MIT Sloan CISR
Cambridge, MA 02142
kmoloney@mit.edu

Nils O. Fonstad
MIT Sloan CISR
Cambridge, MA 02142
nilsfonstad@mit.edu

Abstract

The digital economy poses existential threats to—and game-changing opportunities for—companies that were successful in the pre-digital economy. What will distinguish those companies that successfully transform from those that become historical footnotes? This is the question a group of six researchers and consultants from Boston Consulting Group set out to examine. The team conducted in-depth interviews with senior executives at twenty-seven companies in different industries to explore the strategies and organizational initiatives they relied on to seize the opportunities associated with new, readily accessible digital technologies. This paper summarizes findings from this research and offers recommendations to business leaders responsible for digital business success.

Keywords: Business strategy, organizational design, practice-oriented research, digital innovation, business agility

Introduction

Digital technologies are changing how business is conducted. For example, sensors on equipment from elevators to wind turbines to agricultural equipment deliver big data for predictive analytics and new innovative service models. SMACIT (social, mobile, analytics, cloud, and internet of things) and other digital technologies present great opportunities for established companies to offer new, compelling value propositions, especially by combining their existing competencies with new digital capabilities. Anxious to seize the moment, companies are reevaluating existing strategies and practices.

To help companies seize the opportunities of new digital technologies, we embarked on a study we called *Designing Digital Organizations*. The study explored the question: How do companies adapt as they

recognize the opportunities associated with new, readily accessible digital technologies? We wanted to understand companies' digital strategies and how they design themselves to achieve those strategies.

A distinguishing feature of SMACIT and other new digital technologies is their accessibility. The technologies themselves, as well as applications of the technologies, are readily available in the marketplace. Clever applications of digital technologies can be quickly replicated. Thus, they do not offer sustained competitive advantage (Carr 2003; Piccoli et al. 2005).

In this study we found that because the technologies are readily accessible, small companies that can move quickly to implement new applications have an early advantage. Consequently, established companies can only gain competitive advantage by doing something difficult or impossible to replicate (Mata et al. 1995). The companies we studied were attempting to enhance their value proposition by integrating existing business capabilities with new capabilities made possible by SMACIT and related technologies. This integration took a variety of forms: (1) creating unique, value-adding connections among the company's products and services, (2) enabling meaningful integration of internal business capabilities, (3) permitting seamless interactions with customers and partners, or perhaps even (4) facilitating extraordinary coordination of discrete events. Such uses of technology to integrate a company's strategic capabilities are difficult to accomplish and thus difficult to replicate (Melville 2004; Piccoli et al. 2005). Consequently, *integration enabled by digital technologies, rather than useful applications alone, constitutes the basis for competition in the digital economy.*

Companies in our study that have already built some integrated capabilities (e.g., end-to-end business processes, linkages to external partners, integration of services across channels, and an integrated view of the customer) are positioned to widen the gap between themselves and their competitors and to keep pace with customer demands. In those cases, increased integration has required not just new digital connections but also radical organizational redesign (Mocker et al. 2015). Our research suggests that integration enabled by digital technologies allows companies to successfully transform for the digital economy.

Our research identified three key elements that established companies use to successfully leverage the opportunities of digital technologies:

1. A *digital strategy* that clearly defines the value proposition that the company's integration initiatives will pursue,

2. An *operational backbone* that provides the capabilities for operational excellence,

3. A *digital services backbone* that facilitates rapid innovation and responsiveness to new market opportunities.

This paper describes each of these keys to success. We then conclude with recommendations for companies that are ready to embark—or have already embarked—on a journey to become successful digital organizations.

About this Research

The research involved semi-structured interviews with three senior executives – at least one within IT and one in a business function – in 27 companies.[1] We conducted the one-hour interviews by phone. We solicited participants by approaching the chief information officers (CIO's) of MIT CISR's 80 sponsor companies and of another four companies that we had learned were becoming more digital. Boston Consulting Group also invited companies that their consultants knew were in the midst of digital transformations. Specifically, we asked if they would like to participate in research on how companies were redesigning themselves for the digital economy. While many responded that they were too early in the transformation to participate in the research and a few were concerned about the confidentiality of their digital initiatives, 27 companies agreed to participate.

---

[1] In three companies, we conducted only two interviews. In three companies, we interviewed more than three executives (five in one, six in another, and 12 in the third.)

As shown in Table 1, companies in the research sample represented a variety of industries. For the most part, they were large (thousands of employees) and old (only two were less than 25 years old). Thus, our sample afforded a good opportunity to observe the nature of transformation in companies where it was sure to be challenging.

The interviews explored (1) how each company assessed the opportunities associated with digital technologies and how their industry was changing; (2) the business strategies leaders were formulating to address opportunities; and (3) the organizational design changes they were implementing to execute their digital strategies.

We recorded and transcribed each interview. We manually coded transcripts, primarily using the NVivo qualitative data analysis software. Except for two companies, which we featured in full case studies (13-14 pages), we summarized the interviews from each company in a four- to eight-page vignette written according to a prescribed template (i.e., background, strategic context, business model changes, design changes). We then conducted across-case analysis of the company vignettes and cases with Excel spreadsheets, in which we organized the qualitative data on business model changes and on design changes, and identified themes across companies.

Nine company vignettes and the two cases have been approved for publication. Those companies are cited by name throughout this paper.[2] The remaining sixteen companies informed the findings but are not referenced. In this paper we also cite two related cases that were conducted before this research study, and we occasionally cite public sources to highlight our findings.

Two Digital Strategies

As company leaders recognize the opportunities created by new digital technologies to enhance integration, they are defining digital strategies. These are not separate technology strategies. Rather, they are business strategies that incorporate the opportunities that the digital economy presents (Chen et al. 2010). We define a digital strategy as*: A business strategy, inspired by the capabilities of powerful, readily accessible technologies (like SMACIT), intent on delivering unique, integrated business capabilities in ways that are responsive to constantly changing market conditions.*

We found that company leaders who had recognized the opportunities presented by new digital technologies articulated one of two types of digital strategies: customer engagement or digitized solutions. In the sample, 10 companies were pursuing a customer engagement strategy, while 13 companies were pursuing a digitized solutions strategy. Respondents at the other four companies were experimenting with some applications of digital technologies, but they had not yet articulated a clear strategy.

The two digital strategies define how companies seek to combine their existing capabilities with the capabilities of new digital technologies to create new value propositions.

Customer Engagement

A digital customer engagement strategy transforms a company's go to market approach. The strategic focus is on creating loyalty and trust—and in the best cases, passion—by providing superior, innovative, personalized, and increasingly integrated customer experiences. In many cases, a customer engagement strategy targets a seamless, omni-channel experience so that customers can order, inquire, pay, and receive support in a consistent way from any channel at any time. Because the goal is customer loyalty, companies in our research sample constantly raised their game as they identified new opportunities to connect and integrate.

---

[2] The 11 companies are: Cameron International, Ferrovial, Kaiser Permanente, the LEGO Group, Principal Financial Group, Schindler Group, Schneider Electric, Toyota North America, Unum, USAA, and Wells Fargo. We cite the vignettes that we have published as working papers where we first mention the content about each company.

Table 1. Companies in the Research Sample: Demographics			
Company	Industry	Number of Employees	Year Founded
1	Heavy Manufacturing	Between 50,000 and 99,999	Before 1900
2	Heavy Manufacturing	More than 300,000	Before 1900
3	Heavy Manufacturing	Between 50,000 and 99,999	Before 1900
4	Heavy Manufacturing	Between 10,000 and 49,999	Before 1900
5	Heavy Manufacturing	Between 10,000 and 49,999	Between 1950 and 1999
6	Other Manufacturing	More than 300,000	Between 1900 and 1949
7	Other Manufacturing	Between 100,000 and 300,000	Before 1900
8	Other Manufacturing	Between 100,000 and 300,000	Before 1900
9	Other Manufacturing	Between 100,000 and 300,000	Before 1900
10	Other Manufacturing	Between 10,000 and 49,999	Between 1900 and 1949
11	Other Manufacturing	Between 10,000 and 49,999	Between 1900 and 1949
12	Pharmaceuticals	Between 10,000 and 49,999	Between 1950 and 1999
13	Civil Engineering	Between 50,000 and 99,999	Between 1950 and 1999
14	Financial Services	Between 100,000 and 300,000	Before 1900
15	Financial Services	Between 10,000 and 49,999	Between 1900 and 1949
16	Financial Services	Between 10,000 and 49,999	Before 1900
17	Life and Health Insurance	Less than 10,000	Before 1900
18	Software/IT Services	Between 100,000 and 300,000	Between 1950 and 1999
19	Software/IT Services	Less than 10,000	Between 1950 and 1999
20	Software/IT Services	Between 10,000 and 49,999	Between 1950 and 1999
21	Information Services	Less than 10,000	Between 1950 and 1999
22	Information Services	Less than 10,000	Before 1900
23	Information Services	Less than 10,000	Between 1950 and 1999
24	Health Care	Between 100,000 and 300,000	Between 1900 and 1949
25	Department Stores	Less than 10,000	Between 1900 and 1949
26	Government	Between 10,000 and 49,999	Between 1900 and 1949
27	Transportation	Less than 10,000	Between 1950 and 1999

Table 1. Companies in the Research Sample: Demographics

For example, the non-profit integrated health care organization Kaiser Permanente is pursuing a customer engagement strategy (Kagan et al. 2016). Fueled by what it calls its 'consumer digital strategy,' Kaiser approaches health care as a collaboration between providers and members. Digital technologies provide seamless, low-cost access to care teams, as the organization tries to facilitate preventative, as well as traditional, patient care.

"We need to make it easy for people to get access to care anytime and anywhere, preferably from any device, so that they can reach us. They can have access to their care team, and we want to provide them leading-edge technology, like video visits with your doctor from your smartphone." (Richard Daniels, Executive Vice President and Chief Information Officer, Kaiser Permanente)

Kaiser Permanente capitalizes on the opportunities created by SMACIT in the following ways:

- Offering new digital channels to increase the opportunities for patient interactions with care delivery teams,

- Applying data analytics to identify the need for—and most effective approach to—personalized medical outreach,

- Leveraging social media to develop communities of patients with similar interests and to create care circles that engage patients and their families with care providers.

Ten years ago Kaiser Permanente was widely disparaged for inconsistent customer services (Goldsmith 2014). As it delivers on its consumer digital strategy, the organization is earning the health care industry's highest net promoter scores (USAA, Kaiser Permanente 2014). In addition, seventy percent of members are actively engaged online, and Kaiser Permanente studies have shown that members who engage digitally are healthier, more adherent with medications, more satisfied, and twice as likely to stay with the organization.

Other examples of customer engagement strategies include Nordstrom's commitment to a personalized seamless experience across full-price, off-price, in-store and online shopping options.

"Our goal is to build a 'One Nordstrom' customer experience. We know the value of our strategy, in addition to driving sales, new customer acquisition and increased market share, is that customers who shop Nordstrom across multiple channels spend more than that of a single-channel customer" (Nordstrom 2015 Annual Report)

For USAA, providing an extraordinary customer experience has meant redesigning the company to help its members navigate important "life events" (e.g., getting married, having a baby, buying a house, retiring) (Beath et al. 2016; Mocker et al. 2015). This focus enables USAA to offer a seamless, multi-channel experience to its members.

"In digital, your customer experience matters. We have, for now, one app. We have one website. Everything comes into one user experience." (Zack Gipson, Chief Innovation Officer, USAA)

The LEGO Group's customer engagement strategy is fueled by an ambition to inspire and develop the builders of tomorrow through creative play and learning. This has included allowing consumers to propose new products using existing LEGO pieces (Andersen et al. 2016).

"The process around LEGO Ideas is to turn innovation upside down. It is not product push but product pull, from the markets, from our users. [A consumer] suggested LEGO Minecraft and within forty-eight hours we had 10,000 people saying, "If this product was out there, I would buy it." And by the way, they crashed our server two or three times during that weekend." (Erik Hansen, Senior Director, Technology and Open Innovation, the LEGO Group)

Digitized Solutions

A digitized solutions strategy transforms a company's business model by reformulating what the company is selling. Digitized solutions enhance products and services with information or expertise to help solve customer problems. Digitized solutions add value by not just selling a product but also offering ongoing value-added service related to the use of that product. Companies adopting digitized solution strategies may ultimately become service companies, with their products being just part of the overall service. Over time, digitized solutions change business models by moving the revenue stream from the sale of a product to recurring revenue from ongoing services (Porter et al. 2014; Porter et al. 2015).

The Schindler Group (Schindler), a global provider of elevators, escalators and related services, is an example of a company with a digitized solutions strategy (Sebastian et al. 2016). Over the last decade, Schindler has redefined its value proposition from product-focused engineering to urban mobility solutions.

Schindler leverages the Internet of Things (IoT) to collect real-time data on customers' elevators and escalators. The company analyzes this data to improve the quality of both the assets it sells and the services it provides for those assets. Initially, Schindler focused data and analytics on operational

excellence—helping service technicians diagnose problems, identify needed parts, and repair assets quickly and consistently across all Schindler locations globally.

More recently, data and analytics are helping Schindler develop predictive models and new products and services. Complex algorithms apply IoT sensor data to predict equipment failure and spare part demand. In addition, Schindler's elevator control technology ("PORT") applies authentication and smart algorithms to optimize elevator routes. At morning and evening peak times, this technology helps manage the efficient movement of as many as ten thousand people in a large building. It also helps visitors gain authorization to enter secured buildings using their mobile phones, allowing them to bypass lobby security stations.

"When you have our PORT Technology on your phone, the building will recognize you and know where you want to go, so you don't need your badge. If you're a visitor, we send you a message on your smartphone, and then you can flow into the building without signing in at the reception desk." (Michael Nilles, Chief Digital Officer, Schindler Group)

The sophisticated analysis of high volume data and thus the opportunity to offer unique services plays an important role in digitized solutions strategies. Another example of a digitized solutions strategy is General Electric's (GE) focus on managing the performance of big assets, like wind turbines and aircraft engines. The company builds IoT capabilities to develop new service value propositions related to analyzing, predicting and improving productivity of assets and operations (Winnig 2016). Similarly, John Deere is committed to developing smart, connected products and ecosystems to enhance both machine performance and farming practice (Porter et al. 2014). Royal Philips is integrating medical equipment with clinical decision support software and workflow systems to facilitate better collaboration among all stakeholders (Philips Strengthens 2015). Ferrovial is using digital technologies to develop and operate infrastructure solutions, such as toll roads with rates that vary according to demand (Fonstad et al. 2016).

Digital Strategy Involves a Choice

Companies like Kaiser Permanente, Schindler Group, USAA, Principal Financial Group, Schneider Electric, and the LEGO Group allowed their chosen digital strategy to drive major investments (Beath et al. 2016; Scantlebury et al. 2016). In doing so, they enabled the company to integrate new processes around clear principles. But while these companies made a clear choice of one strategy, they did not ignore the other strategy. In other words, choosing a customer engagement strategy did not mean the company would not invest in solutions; it meant that decisions on products and solutions would be guided by the customer engagement strategy. Similarly, companies choosing a digitized solutions strategy demonstrated a commitment to supporting their new solutions with great customer service.

For example, USAA has chosen a customer engagement strategy. This means that product decisions are expected to help create—and never hinder—extraordinary customer experiences triggered by a member's life events. USAA's mission is to facilitate the financial security of its members. USAA has people responsible for developing, or partnering with others, to deliver great products to do this. But USAA will not offer a product that cannot be serviced as part of an exceptional customer experience. And the focus of new product development is driven by perceived gaps in USAA's ability to service customer life events.

In contrast, Apple is an example of a company that has chosen a digitized solutions strategy. Apple's products are highly integrated, and its strategy is driven by an emphasis on engineering a solution that addresses individuals' daily communication and information needs. This engineering has resulted in solutions that certainly engage customers, but customer engagement takes a back seat to the company's focus on consistently improving the solution itself. A customer engagement strategy might have made Apple resistant to changing the electrical cord connector on a new device or to releasing a product in the U.S. that required customers to wait for a shipment from China. But product decisions define Apple's value proposition. Apple is also famous for providing an extraordinary customer experience, but that experience is built around the company's commitment to digitized solutions (Isaacson 2012).

Unquestionably, targeting one digital strategy requires consistently making tough choices. But those companies that had a clearly articulated strategy were positioned to build and leverage the appropriate information technology enablers. Understanding what they were trying to accomplish enabled them to build capabilities that were integrated across the organization.

An Operational Backbone Enables Operational Excellence

The companies in our research study found it easier to articulate a digital strategy than to execute it. To start with, increasing digitization demanded that they flawlessly execute transactions and related business processes. In other words, these companies needed the digital capability to ensure predictable processes, transactions, and interactions. For this they relied on what we call an operational backbone.

We define an operational backbone as *the set of business and technology capabilities that ensure the efficiency, scalability, reliability, quality, and predictability of core operations.* Operational backbones are often referred to as "digitized process platforms" (Ross et al. 2006). Companies have been building operational backbones since the late 1990s, when the emergence of enterprise resource planning systems (ERPs) and customer relationship management systems (CRMs) clarified the benefits of standardized and integrated systems and processes (Bradley et al. 2011; Mocker et al. 2015; Ross 2003; Tamm et al. 2015; Venkatesh et al. 2007). In our study, most companies' operational backbones relied on multiple technology platforms, which included outsourced, purchased and in-house developed platforms. Important core software included ERPs, custom built databases, web portals, and cloud-based software as a service.

Although each company's operational backbone targeted its own unique strategic requirements, the most common elements were:

- A single source of truth for critical data (e.g., customer, order, and product data),

- Seamless and transparent transaction processing,

- Standardized back office shared services.

Despite the long history of companies building operational backbones, only 15 of the companies in our research sample described operational backbones that supported their digital strategies. The remaining 12 companies had managed to survive without wiring in operational excellence. Without an operational backbone, however, they lacked seamless operations. As a result, they did not have the basic competencies essential to conducting digital business and delivering on a customer engagement or digitized solutions strategy.

Companies with operational backbones were increasingly automating repetitive processes, thus enhancing their speed and accuracy. Moreover, the reliability provided by the operational backbone allowed management to focus on strategic issues rather than fighting fires. The following examples demonstrate how powerful operational backbones enabled companies in the research sample to build the operational excellence that was critical to executing their digital strategies.

At the heart of USAA's operational backbone is a customer database that ensures that USAA employees who interact with members have full information on each member's accounts, transactions and interactions, regardless which channel is used. This knowledge is important for supporting each member's "life events," which invariably cross product lines.

For Ferrovial, the drive to enhance speed and accuracy meant building an operational backbone of shared back-office services. The backbone imposes few limitations on the other business processes of each of Ferrovial's four diversified businesses, while allowing the company to manage solutions across multiple lines of business.

The LEGO Group implemented its ERP to streamline supply chain processes and ward off bankruptcy in 2004. But that was just the first component of a backbone that has since standardized processes related to human resources management, manufacturing, and product lifecycle management. This backbone ensures effective operations and customer satisfaction, so that the company can focus on nurturing its global community of creative builders.

"One of the things people often overlook is the massive system integration and to what degree the LEGO Group is actually an IT-driven company as much as a brand-driven company." (Jørgen Vig Knudstorp, Chief Executive Officer, the LEGO Group)

Like the LEGO Group, Schindler Group's operational backbone started with an ERP implementation that provided technology standards and value chain optimization across formerly independent subsidiaries.

The technology and process standardization enabled by the backbone has made it possible for Schindler to enrich processes and products with sensor data.

Kaiser Permanente's operational backbone is built around the electronic health record. The EHR is essential for both accurate record keeping and for collaboration among physicians and between health care providers, patients, and their families.

A key element of Nordstrom's operational backbone is the transparency of its supply chain. This transparency allows both employees and customers to see and easily acquire any item the company has available at any warehouse or store. It also facilitates easy returns across all channels. Nordstrom's backbone provides a fast, personalized, seamless customer experience (Nordstrom Investor Presentation 2016).

At established organizations, developing an operational backbone has been a long, expensive, and transformative journey. In our study, even the companies with the most powerful operational backbones found they must continuously invest to improve and extend those backbones. The operational backbone allowed companies to scale up quickly when they moved into new markets, acquired similar companies, or introduced new products. In addition, the operational backbone facilitated integration of digital capabilities. We found, however, that an operational backbone was a necessary but not sufficient condition for executing a digital strategy.

A Digital Services Backbone Enables Rapid Innovation

Precisely because the operational backbone is designed for reliability and efficiency, it does not offer the speed and flexibility companies need for constant, rapid digital innovations. As a result, a growing number of companies are defining a second backbone that we refer to as a digital services backbone. We define a digital services backbone as *the set of business and technology capabilities that enable rapid development and implementation of digital innovations.*

The architectural requirements for the digital services backbone are concerned with facilitating continuous innovation without risking the reliability of the underlying operational backbone. Common technological characteristics of the digital services backbone include:

- Digital components including both technical services, like biometrics, and business services, like customer alerts,

- Platform as a service—a technology hosting environment where the company can store and access large numbers of loosely connected microservices,

- Repositories for collecting massive amounts of public (e.g., from social media), purchased, and/or sensor data,

- Analytics engines for converting the above data into meaningful insights,

- Connections to data and processes residing in the operational backbone.

Our study found that as companies recognized the limitations of their operational backbones with regard to enabling rapid digital innovation, they architected and built digital services backbones, as demonstrated by the following examples.

Kaiser Permanente's "Generation 2 Platform" supports a set of 21 (and growing) technology components for clinical and operational services that can be assembled on a cloud-based self-service portal. The platform, along with Kaiser's IT services management model, has greatly reduced the barriers to entry for digital innovations at the department level.

Royal Philips describes its HealthSuite Digital Platform as "an open eco-system optimized for rapid innovation" (HealthSuite Digital Platform n.d.). This cloud-based infrastructure currently collects, aggregates and analyzes health, lifestyle and clinical data from more than seven million connected devices, sensors and mobile apps, as well as electronic health record systems (Philips Strengthens 2015). The data and related algorithms are accessible as services through a public API (AWS Case Study n.d.).

The LEGO Group has cited a need for what it calls an "engagement platform" to allow for rapid introduction (and elimination) of functionality. This platform will host loosely coupled microservices aimed primarily at personalizing customer's experience.

GE has highly publicized its Predix platform, a cloud-based environment that provides access to services supporting the management of big assets. These services range from remote monitoring and diagnostics to predictive maintenance and the provisioning of incremental power on an as-needed basis. The Predix platform is open to any business within GE and any other company that wants to create and deploy asset performance management applications (Winnig 2016).

Schlumberger, a leading information solutions provider in the oil and gas industry, created a product platform that married a previously siloed geological modeling software product, called Petrel, and Ocean, its collaborative open software platform. The Ocean-Petrel platform was then opened up to internal and external contributors and users to foster the company's innovation network and ultimately increase customer satisfaction. Plugins that integrate with Petrel data, developed by both internal and external contributors, are available in the Ocean store (Nehme et al. 2015).

Table 2 summarizes the status of the companies in our research study in defining digital strategies and building operational and digital services backbones.[3] Different shading of the table highlights four groups: 1) companies that have built both operational and digital services backbones (darkest shading), 2) companies that have an operational backbone, but have not yet started to define a digital services backbone, 3) companies that only have a digital services backbone, and 4) companies with neither (no shading).

Most digital services backbones are still under construction or in a design phase. In our study, 12 companies had created, or were in the process of designing, a digital services backbone. In almost all cases (10 companies in group 1), the development of an operational backbone preceded the digital services backbone. The two digital strategy types were equally represented in group 1 (five companies within each strategy type), suggesting that the two backbones are essential whether the driving focus is digitized solutions or customer engagement.

In contrast, only two exceptions (group 3), both with digital solutions strategies, were building a digital services backbone, but had not developed a strong operational backbone. One company, in manufacturing, was developing new, innovative solutions that focused on collecting, analyzing and providing insights about equipment. The other company, in the software/IT services field and relatively young and small, took a start-up approach. Start-ups invariably build digital services backbones before they build operational backbones because they don't need to manage the scale of a large company.

Companies that had built an operational backbone but had not yet defined a digital services backbone (five companies in group 2) were close to beginning a digital transformation. Three companies were likely held back by their difficulties in choosing a digital strategy. In two cases, the opportunities associated with new digital technologies were only emerging in their industries; customer expectations had not yet begun to change.

Companies that had neither operational backbone nor digital services backbone (group 4) were struggling to execute their digital strategies and start successful digital transformations. These companies had defined strategies (nine of 10 companies), with the two strategy types close to equally represented. In many cases, leaders were only beginning to articulate the essence of the two backbones for the future (i.e., the business and technology capabilities). Typically, these businesses operated in silos and IT was not well managed. Not surprisingly, most had not developed enterprise-level IT capabilities.

---

[3] In the Strategy column of Table 2, DS refers to Digitized Solutions strategy, CE refers to Customer Engagement Strategy, and N/A means that the company has not articulated a digital strategy in the interviews of our research study.

Company	Strategy	Operational Backbone Essence	Digital Services Backbone Essence
**Table 2. Digital Strategies and Essence of the Backbones**
1	DS	Global standardized operational processes (packaged SW)	Proactive and predictive monitoring with sensor data
3	DS	Global standardized operational processes (packaged SW)	Telematics and performance management with sensor data
7	DS	Standardized shared customer relationship management (cloud)	Proactive and predictive monitoring with sensor data
9	DS	Enterprise-wide standardized operational processes – mostly cloud	Aggregation & analysis of health, lifestyle, clinical data from sensors, devices, EHRs
13	DS	Standardized shared CRM; business process outsourcing (cloud)	Digital platform for innovation (in progress)
6	CE	Standardized operational processes; central customer database (mostly cloud)	Customer experience platform with telematics & analytics
11	CE	Global standardized operational processes (mostly packaged)	Customer engagement platform focused on real-time community (in progress)
15	CE	Centralized customer database (homegrown)	Personalized, flexible customer experience within a topic area (in progress)
16	CE	Centralized customer database and reusable SoA components (homegrown)	Continually adjusted customer experience with analytics and behavioral economics (in progress)
24	CE	Enterprise-wide electronic health record (EHR) system (packaged SW)	Same-day delivery of technology services to clinical and operational departments
20	DS	Standardized key business processes and organizational management system (homegrown)	N/A
26	CE	Enterprise-wide standardized operational processes (homegrown)	N/A
5	N/A	Global standardized operational processes (packaged SW)	N/A
10	N/A	Global standardized operational processes (packaged SW)	N/A
12	N/A	Global standardized operational processes (homegrown)	N/A
2	DS	N/A	Performance management with sensor data
19	DS	N/A	Knowledge, data, real-time community services with analytics, facilitation of interactions
4	DS	N/A	N/A
8	DS	N/A	N/A
18	DS	N/A	N/A
21	DS	N/A	N/A
22	DS	N/A	N/A
14	CE	N/A	N/A
23	CE	N/A	N/A
25	CE	N/A	N/A
27	CE	N/A	N/A
17	N/A	N/A	N/A

Table 2. Digital Strategies and Essence of the Backbones

The risk to companies that are not designing and building out well-defined digital services backbones is that they will be too slow to capture digital opportunities. If they try to build all their digital functionality onto an operational backbone, development will be slow and expensive. Operational backbones are built to last. Because they insure the integrity of transactions and of master data, companies carefully manage releases for maintenance, upgrades, and enhancements to them.

In contrast, microservices and apps come and go quickly. Companies are building continuous delivery (i.e., DevOps) into their digital services backbones to facilitate speed. Companies that were building digital services backbones were attempting to define appropriate architecture principles for them. If they built digital functionality as one-off products or services (as opposed to architecting reusable digital services), they risked creating massive numbers of unmanaged APIs. Most interviewees anticipated that digital services would be built and used by many people inside and outside the company. A powerful digital services backbone can ensure secure, reliable access to data and capabilities that are subsequently built on the digital services backbone or accessed from the operational backbone.

The greatest challenge related to the digital services backbone is that effective digital services invariably tie back into core operations. For example, for a digitized solutions strategy that leverages IoT sensor data, services related to alerts and proactive maintenance of equipment are much more powerful if IoT insights can be integrated with business processes and data (e.g., customer, transaction and service contract data) that reside in the operational backbone environment. The Chief Digital Officer of the Schindler Group noted that the company's operational backbone was a critical prerequisite for digital innovation, enabling them to be much faster in developing digital solutions.

"The global business process platform was an important prerequisite for the Leading Edge Digital Business [Initiative], because by harmonizing our global process landscape, we could all be much faster, much more agile in terms of digital solutions." (Michael Nilles, Chief Digital Officer, Schindler Group)

Our sense is that companies that have not developed operational backbones are thus doubly cursed—they have neither the operational excellence required for success in the digital economy, nor the ability to connect their digital services backbone with reliable transactional or master data.

Accommodating the Two Backbones

Companies in our research were in the midst of transformations intended to position them for success in the digital economy. Regardless of their digital strategy—customer engagement or digitized solutions—it was clear that companies needed to adopt both an operational backbone and a digital services backbone to deliver the efficiency, reliability, speed, and agility that the competitive environment was demanding. In our research study, we were not able to distinguish characteristics of the digital services backbone that varied by digital strategy. As these backbones mature, such differences, if they exist, should become apparent. On the other hand, we were able to identify important distinctions between the two backbones. As companies adopt the digital services backbone, they quickly start to recognize the differing organizational demands. We summarize these differences in Table 3.

Technology Differences Are Not an Important Distinction

Prior research has found that companies with strong operational backbones carefully designed (architected) their systems, processes and data to meet requirements for enterprise-wide integration and standardization. Those companies typically architected end-to-end business processes and appointed process and data owners to manage and coordinate their IT-enabled business environments (Ross et al. 2006). Building an operational backbone involved massive organizational changes and significant investments in large systems, or in vendors providing major enterprise services. Because implementing enterprise systems involved wiring in core processes and collecting and managing critical operational data, implementation was slow.

Our research found that digital services backbones, in contrast, typically rely heavily on cloud-based vendor and partner solutions, which support rapid development and reuse of microservices. At most companies they are being built in "green field" (no legacy in place) environments, and, as a result they can be implemented much more quickly.

	Operational Backbone	Digital Services Backbone
Table 3. Fundamental Differences Between the Two Backbones		
Management Objective	Business efficiency and technology reliability	Business agility and innovativeness
Architecture Principles	Standardized end-to-end business processes; transparency into systems; data access	Plug and play business and technology components
Data	Single source of truth for transactional data	Massive repositories of sensor/social media/purchased data
Key Roles	Process and data owners	Product or service owners
Key Processes	Roadmapping; architecture reviews	Cross-functional development; user-centered design
Delivery Method	Fast waterfall/regular SW releases/SaaS adoption	Agile and DevOps; MVP/Constant enhancements
Funding	Major project/program investments	Continuous funding by business owners

Table 3. Fundamental Differences Between the Two Backbones

However, the distinction between the two backbones is not technological. For many big, old companies the operational backbone is built on mainframe technologies, while the digital services backbone is built in the public—or even in a private—cloud. But, already some companies' operational backbones are supported on an off-site cloud. Ferrovial, for example, found it could accelerate development of an operational backbone by relying on software as a service (SaaS). Using cloud services, Ferrovial's 70,000 employees adopted standardized HR and purchasing processes in six months.

Other companies lacking operational backbones are finding that cloud services offer a viable alternative to big packaged software. In its transformation from "manufacturer and distributor of electrical products" to "provider of intelligent energy management solutions," Schneider Electric installed a cloud-based CRM to facilitate cross-selling in its diverse businesses (Karunakaran et al. 2015). Within eighteen months, the CRM had been adopted by 25,000 employees in over 100 countries and had increased cross-selling by 20 percent. As other companies adopt cloud options to accelerate development of operational backbones, the current dominance of mainframe technologies as the foundation for operational backbones will likely vanish.

Organizational Characteristics Are Key Distinctions

While the technological differences between the two backbones are likely to diminish with time, the need for their differing organizational characteristics will likely remain. To start with, companies pursue different goals from their two environments. The enterprise backbone remains an essential requirement for reliability and efficiency.

"LEGO Enterprise Platform … is the IT below all the business processes that run the LEGO Group end to end. It is all the software and hardware and the wiring that run the LEGO Group beneath the human interaction." (Henrik Amsinck, Chief Information Officer, the LEGO Group)

Meanwhile, the digital services backbone facilitates rapid innovation.

"There are new spaces where software development is still at the edge, and revolutionary—areas like consumer interaction and new products. What is the next upcoming disruptive gaming or consumer-engaging technology that could really impact our business and our business model? That evolution is

unlikely to take place anywhere near our [enterprise platform] development center." (Jørgen Vig Knudstorp, Chief Executive Officer, the LEGO Group)

Delivering on these two different management objectives is driving a number of distinct processes. For example, companies rely on roadmapping and traditional architecture reviews to guide development of the operational backbone. In developing their digital services backbone, they rely on cross-functional development teams and user-centered design techniques.

These different design processes lead to two different development methodologies. Most companies are still applying traditional development methodologies to their operational backbones—although a number of interviewees mentioned that the traditional waterfall is evolving to a more collaborative and scaled-down "fast waterfall." Companies are anxious to accelerate development of the operational backbone, but they primarily achieve that by relying more heavily on SaaS (software as a service) rather than packaged software or inhouse systems.

In contrast, companies are relying on agile development to deliver services on their digital services backbones. Most IT interviewees described deployment of small cross-functional teams adopting iterative, agile methodologies to build and test new services through minimum viable products. Kaiser Permanente has moved beyond agile to a 'DevOps' model, which entails near-continuous deployment of new code, with the goal to drastically reduce cycle times. The 'DevOps' model forces IT units to radically rethink when and how they push new code to the production environment.

The digital services backbone also disrupts traditional funding models. For companies approaching continuous delivery on their digital services backbones, traditional project funding is too slow if not irrelevant. The pay-for-use model, which is similar to cloud and vendor servicing models, is gaining popularity. In several organizations, funding is shifting to more discrete purchases by business units on an as-needed basis. Kaiser Permanente, for example, enables clinical and operational departments to purchase technology services directly from IT on the 'Generation 2 platform'. Departments are billed monthly and can choose and discard services depending on their needs and department budget. GE is creating new services and putting them into its "services store." Account managers can shop from the services catalog to assemble a package of services for individual clients.

Transforming the IT Unit

As companies attempt to manage two organizationally distinct backbones, while also integrating them, IT units are fundamentally transforming.

Kaiser Permanente transformed its IT organization by adopting a service-centric operating model. IT now designs standard assemblies for IT services that are chosen by its business users. Schindler's IT transformation involved creating Schindler Digital Business AG, which houses teams focused on the operational backbone as well as teams building and maintaining digital services. The digital services teams have been specifically charged with digital innovation.

"We have put them together as a new organization, fully focusing on this digital innovation part of the company. We need to have these people understanding that this is a day-to-day job, so when waking up in the morning they should think about digital business and not something else. That was super important: having this clear commitment. (Michael Nilles, Chief Digital Officer, Schindler Group)

To ensure that they support integration across vertical business units, as needed, IT units are creating integrator roles. For example, the IT head of Philips HealthSuite Labs plays primarily an integrator role, drawing on resources from across Philips Healthcare businesses. Similarly, at Schneider Electric, the CIO has deployed just two architects to orchestrate the business changes that the company needs to make to implement its integrated digitized solutions strategy:

I needed to work more as an orchestrator. The business leaders need to design their operating models, but we need some central thinking about how the design of all those businesses would impact Schneider on the whole and how we could purposefully create commonalities across the business to gain more scale. (Hervé Coureil, Chief Information Officer, Schneider Electric)

As companies create integrated customer experiences and digitized solutions, they are organizing around services. The Chief Technology Officer of Kaiser Permanente described the IT services management model

as a great shift—from allocating funds to a small number of high value projects to a large number of small transactions with departments making innovative decisions and interacting with IT in new ways. Principal found that designing its systems around services allowed it to open those systems to third party administrators (TPAs) and reuse existing functionality across multiple stakeholders:

"This was the first time we flipped our system around to allow an outside party to actually engage within the software application where we do the work. That was a big deal. And the TPAs were the perfect audience to start with. But once we figured that out I said, "We're going to keep right on going." The next party is the employer. The party after that will be the participant, or the financial professional, the advisor. This is a big transition for us." (Mike Daugherty, Senior Executive, US Retirement, Principal Financial Group)

Although our research identified transformations primarily within IT units, many of the changes our interviewees described will ultimately cascade across the entire enterprise. In some cases, those transformations have already begun. The services orientation, in particular, demands rethinking organization design.

Implications of the Research

Long-established companies like IBM, LEGO, and Royal Philips have succeeded by reinventing themselves as they encountered new threats and opportunities (Andersen et al. 2016; Mocker et al. 2014a; Mocker et al. 2014b). Digital technologies are creating a new moment of truth for successful companies. They are introducing new customer expectations, younger, faster competitors, and revolutionary approaches to management. Past success will not ensure future success. Older companies must transform to take advantage of the possibilities.

To understand how companies must redesign themselves for digital, older companies can surely learn by studying the design of newer highly successful companies like Amazon, Google, Facebook, and Apple. But understanding how companies born digital differ from older competitors is just part of the challenge. Even if a company identifies some key characteristics of digital design, the transformation will be daunting. Established companies cannot just throw out legacy systems, processes, attitudes, and political alignments. They must transition. Many find that their customers still seek mostly their traditional offerings. Thus, even as they try to change their own businesses, they must sell their customers on their new offerings. It will not be an easy journey.

In this research, we have identified the two backbones essential to providing business capabilities for companies making the transformation from old economy to digital economy businesses. This is a useful starting point, but the companies we studied are undergoing massive changes. All participants in this study noted that they were early in their transformations. Ongoing research is needed to track both successful and unsuccessful efforts to transform. It is particularly important to conduct in-depth case studies of successful companies because technology, people, process, strategy, politics, and culture will interact in unexpected ways.

Our research suggests that companies that have not yet captured enterprise capabilities in an operational backbone are in dire straits. The operational backbone supports operational excellence. No company can long exist without the ability to efficiently, reliably, and rapidly process transactions and address customer service requirements. In some industries, operational excellence is still the exception rather than the rule. But once customers can seek out excellence, they are unlikely to suffer incompetence.

It took most large companies multiple years to build an operational backbone. A company without a backbone may not have the needed time to build the underlying capabilities for a digital transformation. Companies without operational backbones need to devise shortcuts to what has traditionally been a transformational journey. This will prove to be an extraordinary leadership challenge.

Recommendations for Practice

We offer five recommendations for companies trying to map a successful journey.

(1) **Define a digital strategy.** By identifying a primary digital strategy, focused on either customer engagement or digitized solutions, companies can focus their people on clear objectives and provide

them with a motivation for change. The right strategy will define the rallying point for integration. With that direction a company can start building integrated (i.e., difficult to replicate) capabilities to deliver on that strategy.

(2) **Invest in an operational backbone—quickly.** An operational backbone has become table stakes for success in the digital economy. Most companies could significantly enhance their digital capabilities by providing transparency into transactions (e.g., the supply chain), or shared access to customer data, or reusable business components (e.g., customer account openings, payments, employee onboarding). Companies lacking an operational backbone should get help from cloud providers, vendors, business process outsourcers—anyone who can accelerate delivery of reusable, efficient, and reliable operational capabilities. Senior management should focus its attention on building just one capability that can make a difference (e.g., a powerful customer database, a transparent supply chain). We advise that companies not begin (or continue) a major ERP implementation. There is no time for that.

(3) **Architect a digital services backbone.** To enable the company's chosen digital strategy, IT leaders should begin to architect a digital services backbone by focusing on the repositories of data (sensor data, customer data, purchased data, social media data) that will be needed for innovations critical to business success. If the company can establish critical data and related APIs, technology partners can help them build the infrastructure they need to protect, connect, analyze, and support innovative services.

(4) **Partner to acquire new skills and capabilities.** Once their digital services backbones are in place, companies will benefit from widespread development of services on that backbone. Companies will be most successful if their customers, suppliers, and other stakeholders are developing front-end apps or microservices to take advantage of their integrated capabilities. They need to design their digital services backbones with that in mind.

(5) **Think services!** Companies can no longer think in terms of projects and operations. Business-IT teams will design and deliver technology and business services that can be defined, priced, prioritized, implemented, enhanced, and discarded. Ultimately, companies will structure themselves around their services. They will empower service owners to ensure the innovation and efficiency other employees need and customers expect. That will be a difficult transition, so it's a good idea to start in IT. Define and deliver IT services to business and IT partners. ITIL-adopting organizations have long embraced this approach to IT management. Over time, it will become the way companies do business.

It's important to note that, as companies adopt these recommendations and embrace the opportunities presented by the digital economy, they must abandon the 'divide and conquer mindset' typical of many large organizations. In the 'divide and conquer' approach, business line or functional leaders acted relatively independently to optimize their business or function's performance. This management approach will never lead to the integration required by the digital economy. Companies that embrace this change can set themselves apart.

References

Andersen, P., and Ross, J. W. 2016. "Transforming the LEGO Group for the Digital Economy," MIT Sloan CISR Working Paper No. 407, March 2016.

"AWS Case Study: Philips," (n.d.). Amazon Web Services, Inc., (available at https://aws.amazon.com/solutions/case-studies/philips/; retrieved May 6, 2016).

Beath, C. M., Moloney, K. G., and Ross, J. W. 2016. "The Principal: Benefiting from a Service-Oriented Architecture," MIT Sloan CISR Working Paper No. 413, April 2016.

Beath, C. M., and Ross, J. W. 2016. "USAA: Defining a Digital Experience," MIT Sloan CISR Working Paper No. 410, April 2016.

Bradley, R., Pratt, R., Byrd, T.A., and Simmons, L. 2011 "The Role of Enterprise Architecture in the Quest for IT Value," *MIS Quarterly Executive* (10:2), pp. 19-27.

Carr, N. G. 2003. "IT Doesn't Matter," *Harvard Business Review* (81:5), pp. 41-49.

Chen, D. Q., Mocker, M., Preston, D. S., and Teubner, A. 2010. "Information Systems Strategy: Reconceptualization, Measurement, and Implications," *MIS Quarterly* (34:2), pp. 233-259.

Fonstad, N. O., and Ross, J. W. 2016. "Ferrovial: Leveraging Internal and External Resources to Innovate Competitively," MIT Sloan CISR Working Paper No. 409, April 2016.

Goldsmith, J. 2014. "An Interview with George Halvorson: The Kaiser Permanente Renaissance, And Health Reform's Unfinished Business," *Health Affairs,* September 30 (available at http://healthaffairs.org/blog/2014/09/30/an-interview-with-george-halvorson-the-kaiser-permanente-renaissance-and-health-reforms-unfinished-business/; retrieved May 6, 2016).

"HealthSuite Digital Platform," (n.d.). Philips, Philips HealthSuite Digital Platform (available at http://www.usa.philips.com/healthcare/innovation/about-health-suite; retrieved May 6, 2016).

Isaacson, W. 2012. "The Real Leadership Lessons of Steve Jobs," *Harvard Business Review* (90:4), pp. 92-102.

Kagan, M. H., Sebastian, I. M., and Ross, J. W. 2016. "Kaiser Permanente: Executing a Consumer Digital Strategy," MIT Sloan CISR Working Paper No. 408, March 2016.

Karunakaran, A., Mooney, J., and Ross, J. W. 2015. "Accelerating Global Digital Platform Deployment Using the Cloud: A Case Study of Schneider Electric's "bridge Front Office" Program," MIT Sloan CISR Working Paper No. 399, January 2015.

Mata, F., Fuerst, W., and Barney, J. 1995. "Information Technology and Sustained Competitive Advantage: A Resource-Based Analysis," *MIS Quarterly* (19:4), pp. 487-505.

Melville, N., Kraemer, K., and Gurbaxani, V. 2004. "Information Technology and Organizational Performance: An Integrative Model of IT Business Value," *MIS Quarterly* (28:2), pp. 283-322.

Mocker, M., Kagan, M. H., and Ross, J. W. 2014a. "Continuous Transformation at IBM: Addressing Disruption from New Technologies," MIT CISR Working Paper No. 398, November 2014, pp. 1-13.

Mocker, M., Ross, J. W., and Hopkins, C. 2015. "How USAA Architected its Business for Life Event Integration," *MIS Quarterly Executive* (14:4), pp. 137-150.

Mocker, M., Ross, J. W., and van Heck, E. 2014b. "Transforming Royal Philips: Seeking Local Relevance while Leveraging Global Scale," MIT CISR Working Paper, No. 394, February 2014, pp. 1-30.

Nehme, J. J., Srivastava, S. C., Bouzas, H., and Carcasset, L. 2015. "How Schlumberger Achieved Networked Information Leadership by Transitioning to a Product-Platform Software Architecture," *MIS Quarterly Executive* (14:3), pp. 105-124.

"Nordstrom 2015 Annual Report," (n.d.). Nordstrom, Inc. (available at https://materials.proxyvote.com/approved/655664/20160311/ar_278376/; retrieved May 6, 2016).

"Nordstrom Investor Presentation March 2016," 2016. Nordstrom, Inc., March (available at http://investor.nordstrom.com/phoenix.zhtml?c=93295&p=irol-investorkit; retrieved May 6, 2016).

"Philips Strengthens Collaboration with Amazon Web Services to Expand Digital Health Solutions in the Cloud," 2015. Philips Media, October 9 (available at http://www.newscenter.philips.com/us_en/standard/news/press/2015/20151008-philips-strengthens-collaboration-amazon-web-services-expand-digital-health-solutions-in-cloud.wpd#.vq-bfrirkun; retrieved May 6, 2016).

Piccoli, G., and Ives, B. 2005. "IT-dependent Strategic Initiatives and Sustained Competitive Advantage: A Review and Synthesis of the Literature," *MIS Quarterly* (29:4), pp. 747-776.

Porter, M. E., and Heppelmann, J.E. 2014. "How Smart, Connected Products are Transforming Companies," *Harvard Business Review* (93:10), pp. 96-114.

Porter, M. E., and Heppelmann, J.E. 2015. "How Smart, Connected Products are Transforming Competition," *Harvard Business Review* (92:11), pp. 64-88.

Ross, J. W. 2003. "Creating a Strategic IT Architecture Competency: Learning in Stages," *MIS Quarterly Executive* (2:1), pp. 31-43.

Ross, J. W., Weill, P., and Robertson, D. 2006. *Enterprise Architecture as Strategy: Creating a Foundation for Business Execution*. Harvard Business Press.

Scantlebury, S., and Ross, J. W. 2016. "Schneider Electric: Redesigning Schneider Electric's Operating Model," MIT Sloan CISR Working Paper No. 412, April 2016.

Sebastian, I. M., and Ross, J. W. 2016. "The Schindler Group: Driving Innovative Services and Integration with Schindler Digital Business AG," MIT Sloan CISR Working Paper No. 411, April 2016.

Tamm, T., Seddon, P. B., Shanks, G., Reynolds, R., and Frampton, K. 2015. "How an Australian Retailer Enabled Business Transformation Through Enterprise Architecture," *MIS Quarterly Executive* (14:4), pp. 181-193.

"USAA, Kaiser Permanente, Amazon.com, Pandora, Costco, Wegmans, Apple, TracFone, Southwest and Westin Among the Highest in Customer Loyalty in the 2014 Satmetrix® Net Promoter® Benchmarks," 2014. PR Newswire, March 5 (available at http://www.prnewswire.com/news-

releases/usaa-kaiser-permanente-amazoncom-pandora-costco-wegmans-apple-tracfone-southwest-and-westin-among-the-highest-in-customer-loyalty-in-the-2014-satmetrix-net-promoter-benchmarks-248541161.html; retrieved May 6, 2016).

Venkatesh, V., Bala, H., Venkatraman, S., and Bates, J. 2007. "Enterprise Architecture Maturity: The Story of the Veterans Health Administration," *MIS Quarterly Executive* (6:2), pp. 79-90.

Winnig, L. W. 2016. "GE's Big Bet on Data and Analytics," *MIT Sloan Management Review* (57:3), pp. 1-22.