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**ABOUT THE AUTHORS**
ADDITIONAL BOOKS

by Mark P. McDonald

The Social Organization, How to Use Social Media to Tap the Collective Genius of Your Customers and Employees
Co-Author with Anthony Bradley

The e-Process Edge, Creating Customer Value and Business Wealth in the Internet Era
Co-Author with Peter Keen
Osborne/McGraw-Hill, 2000

Blog
http://blogs.gartner.com/mark_mcdonald/
DEDICATION

Mark P. McDonald
To Carolyn, Brian and Sarah

Andy Rowsell-Jones
To my darling wife Janice, without whose support nothing is possible
SECTION I
Identify Digital Value
1: Think Differently About Digital

Some companies have an edge, some don’t. You can probably name the companies in your industry that have an edge based on operational effectiveness, innovation or sheer revenue. Maybe your company is one of them.

Your company may have used technology to give it an edge by reducing costs, automating existing processes or turning analog business models into electronic channels. But sharpening any edge becomes increasingly difficult over time. After all, as soon as others figure out how to automate the same processes, where’s the edge? How can companies create a new edge, and sustain it, when grinding away at their current strategies delivers fewer and fewer results?

The answer is digitalization.

A digitalized business creates value and revenue from digital assets. It goes beyond further rounds of process automation to transform processes, business models and customer experience by exploiting the pervasive digital connections between systems, people, places and things. Technologies such as smartphones, tablet computing, social media, big data, analytics, cloud computing, remote sensing and others provide the raw materials to forge a new edge. Any company today —large or small, old or new — can use this digital technology to create a winning edge for its business and, perhaps, its industry.

That is the digital edge.

Executives want this edge. According to a 2012 McKinsey & Company survey, “Minding Your Digital Business,” half of the executives responding view investments in digital technologies as building a competitive advantage in their business. More than 20% overall say that the intent of their digital investments is to build a new business platform or tap new profit pools.

There is a catch: Forming a digital edge requires new thinking and a new approach to access customer value and make revenue and results addressable to the organization. Instead of substituting atoms for bits, a digital edge combines digital and physical resources in innovative ways to deliver that new value. When the organizations studied for this book employed these methods, they solved fundamental contradictions for their customers or business models that made new opportunities possible in ways that are hard for competitors to copy.

Take, for example, the world’s biggest cruise ship.

Royal Caribbean’s Digital Edge on the High Seas

Royal Caribbean Cruises sought an edge when it set out to build the largest class of cruise ship, its Oasis-class ships. Costing more than a billion dollars to build, each ship functions as a small city, with 5,400 guests in 2,700 staterooms served by 2,200 crew members. If you’ve ever sailed on a cruise ship, then you’ll understand how a massively populated, at times crowded, experience would only be intensified on an even-larger ship.
Royal Caribbean wanted an operational edge by sailing 5,400 vacationers on one large ship rather than multiple smaller ships. But if the size of the ship overwhelmed passengers with overcrowding and long lines, any operational edge would be offset by customer dissatisfaction. The company’s challenge required resolving a fundamental contradiction: How could each guest enjoy a personalized experience on a massive ship with thousands of other guests?

Without digitalization, they can’t.

Royal Caribbean built its Oasis-class ships with pervasive digital connections that transform guests’ cruising vacations into ones that allow them greater individual control to influence their experience. To do this, Royal Caribbean thought about every aspect of the ship and its operations from a guest’s perspective. That experience formed a simple, yet powerful, goal: Zero tolerance for lines. “If you have to stand in line,” explained Bill Martin, vice president and CIO, “the ship suddenly seems too big and the experience diminishes sharply.”

Royal Caribbean applied a key step in forming a digital edge: It started with a clear and unambiguous outcome — eliminating the need for lines on board. Defining this customer outcome provided a fundamental change from implementing technology for technology’s sake. Once this goal was identified, Royal Caribbean convened a cross-functional team to identify the process chokepoints that led to passengers queuing up for everything from boarding the ship to eating in restaurants, attending theater shows, going onshore excursions, using onboard activities such as the rock climbing wall or wave simulator, and checking out and settling their bills. Royal Caribbean could have simply automated these chokepoints with digital technology by, for example, arming staff with tablets to facilitate reservations and providing technical means for passengers to reserve restaurant seats and excursions in advance. Instead, it used digital technology to eliminate chokepoints by creating solutions that allowed passengers to choose how they interact with the ship on their own terms.

**Passengers Control Their Experiences**

When passengers check in at one of the 90 desks in Fort Lauderdale, Florida, their photos are taken and routed to a digital profile that forms the basis for digital support of their experience while on board the ship. The cruise line provides a smart card for onboard activities and purchases. The smart cards, combined with their digital photo facilitate on- and off-boarding of the ship at all ports of call as customers swipe their smart cards and have their digital picture verified by the quartermaster.

Once on board the ship, digital technologies give passengers greater direct control of their own experiences via smartphone apps and digital signage, thus connecting customer behaviors with the cruise line’s “no line” goals.

Imagine the potential for lines when 5,400 people are hungry at about the same time. Rather than telling people when and where they can eat, Royal Caribbean captures each of the 24 restaurants’ capacity information in real time via shape-sensing cameras. Capacity information is provided to passengers on digital signage located around the ship. Passengers know the available capacity of each restaurant, and use this information to make their own dining decisions. Thus, their individual choices have the collective effect of distributing demand across the ship and reducing crowding at the restaurants.
Royal Caribbean strategically chose to protect passenger privacy by using shape-sensing cameras to count the number of people in each restaurant instead of other technologies. The cruise line uses facial recognition software to recognize individuals in professional photos that were previously posted on a public photo wall. Now, individual photos are available to guests in a personalized binder available on a photo kiosk or the interactive television inside their rooms.

Before departing the ship, guests can view their folios on kiosks throughout the vessel or via a mobile device. In addition to the transaction list, the application lets guests view photos of their signed receipts for purchases. This reduces a frequent chokepoint at departure, when guests dispute their bills.

Each of these scenarios describes how passenger choice rather than company control eliminates lines on board the ship. Passengers benefit from the confidence of making a choice based on information available to them. The cruise line benefits as individual behavior and decisions level out demand at common chokepoints. In the end, Royal Caribbean not only solved the contradiction of creating an intimate experience on the world’s largest cruise ship, it achieved a secondary goal — to provide an onboard experience as grand as the ship itself.

Creating a Digital Edge

In later chapters, we’ll dive into more details about how Royal Caribbean exploited digital information to create happy guests on its Oasis-class ships. We’ll also discuss several other companies that digitalized their businesses with solutions that transformed value and created new revenue, including:

- The Harry Fox Agency (HFA), faced with declining royalties, created a new source of revenue by licensing its digital capabilities to digital music service providers, among others.  
- Children’s Hospital Los Angeles (CHLA) reduced the communications errors that contribute to 70% of patient harm by digitally integrating clinical areas into each patient’s electronic medical record. The hospital then found that its digital depth attracted the best researchers and new grants.
- CDW, a leading provider of technology products and services, created its digital edge by integrating information across the enterprise to deliver a high-touch level of customer service that contradicts conventional wisdom in a high-volume, tighter margin business.
- Rabobank, a leading bank in the Netherlands, used digital technology in its “unplugged” initiative to resolve the conflict between normal banking hours and the hours people would like to bank. Digital technology enabled the bank to distribute its employees out of the branch or corporate office and into the community wherever and whenever customers need their services and support.
- United Stationers, Inc. (United Stationers), a leading national wholesale distributor of business products, aggregated its resellers into a vertical virtual business to win previously unobtainable contracts by combining the customer intimacy of small local resellers with the operational excellence of a multibillion-dollar company.

While each of these companies had a unique goal and applied its own set of digital assets and technologies to realize a specific outcome, their approaches had certain elements in common. This book distills those elements into a fundamental approach for companies of all sizes and in any industry to create a digital edge. This approach also forms the different sections of this book.
An Approach for Creating a Digital Edge

**Identify Digital Value.** Understand how digital technology creates value for customers in ways that increase revenue for the company. This begins with putting outcomes first and reimagining notions of customer value and revenue models as both change in the face of digital technology.

**Select the Right Edge.** An edge forms where two sides meet. Blend digital and physical resources to create a difference that matters. This involves choosing from five different models of a digital edge as a starting point for building digital capability.

**Become a Digital Organization.** Forging a digital edge involves building digital capabilities by listening from the outside in before building from the inside out. The resulting digital capabilities cross traditional organizational boundaries, requiring new ways of leading at the executive and board levels to make the company ready to act on new digital opportunities.

**Identify Digital Value — Recognize the Difference Between Feeling Digital and Being Digital**

The idea of “being digital” has been around since Nicholas Negroponte authored a book of the same title in 1996.\(^9\) His thesis then, and the operative definition of digital to this day, has been the use of technology to replace physical or analog atoms with digital bits. That notion drove billions of dollars of investment as companies took analog business processes and turned them into digital-information-based services. This creates digital transactions, but does it constitute a digital business?

Many companies “feel” digital today. CIOs responding to the 2011 Gartner CIO Survey indicated that, on average, digital technologies dominate more than half (58%) of business operations. But that number tells only part of the story.

Enterprises have experience with applying technology to operations, but in general they are novices at using digital technology to generate new sources of value and revenue, or to create a digital edge. The average firm responding to the 2011 survey attributed only 27% of revenue to digital assets.\(^10\)

Why the disparity between digital operations and digital revenue?

Most organizations focus their strategy on digital transactions, which automate and substitute physical resources for digital. Digital substitution creates virtual copies of the real world, creating e-channels, e-stores and other e-surrogates for physical processes. Substitution does not constitute a sustainable digital edge, as digital technology preserves the fundamentals of current value, revenue and results. An e-store, for example, still uses the same basic business model and business processes of its brick-and-mortar equivalent. That may be more efficient, but it’s also easy to duplicate. Organizations looking to create revenue from digital technology need a strategy that is more powerful than digital substitution.
Figure 1.1 Comparing Levels of Digital Revenue and Processing

The digital edge focuses on the degree to which the business model evolves and expands based on digital capabilities that generate value and revenue. The gap between digital processes and digital revenue highlighted in Figure 1.1 illustrates the potential of a digital edge. A digital edge creates new forms of value and revenue, going beyond mimicking physical business models by building new combinations of digital and physical resources. In the process, they create digital capability where others see contradiction.

Selecting the Right Model Defines the Relationship Between Digital and Physical Resources

An edge represents a frontier, the border where one country gives way to another, where certainty meets opportunity. Rules change when crossing the digital frontier and thus require new ways of thinking about the relationship between the digital and physical worlds. Creating a digital edge requires having a strategy and a map to navigate those relationships. The potential combinations of information, customers, products, services, processes and resources are
endless. After studying a range of companies with a digital edge, the five models depicted in Figure 1.2 took shape, each with a specific configuration of physical and digital resources.

**Figure 1.2. Five Models of a Digital Edge**

Physical resources refer to a company’s people, equipment, facilities and other physical aspects. Digital resources include information, customer history, situational awareness and any equipment with chips in it to process information. This includes mobile phones, tablet computers, sensors, computer-controlled machinery and more. When the term digital technology is used in this book, it is referring to both digital information and digital equipment.

Each of the combinations shown in Figure 1.2 drives a different type of customer value, company revenue opportunities and results. The models illustrate different types of digital edges rather than a maturity model. Each model has a specific impact on the business. 

**Automation** uses digital technologies to raise the efficiency and capacity of physical resources. **Applying** digital technology to physical resources displaces and changes physical and capital requirements. Using digital resources that **accompany** physical resources spans channels and supports new levels of customer service integrity and experience. **Augmenting** physical performance with digital technology transforms human and organizational capability and performance. Finally, digital resources enable organizations to **abstract** information, insight and value from the interactions between digital and physical resources in support of new strategies, products and services. Companies will use multiple models in building their digital businesses, but they must select the right model to get a good start.

**Digital Density Drives the Move to a Digital Organization**

The world is gaining digital density as measured by the amount of information, connections, automation and digitally enabled devices in the world. Density drives new sources of competitive advantage when everyone and everything can be connected via information. The challenge is to make the right connections — the ones that result in greater value, revenue and results.

To understand the potential of digital density, consider the size of our connected world. As of mid-2012, there are more than 5.6 billion mobile devices, 11 almost a billion people on Facebook and more than $20.4 trillion in online sales representing 14% of the world economy. 12 Closed-circuit TV (CCTV) cameras on city streets, RFID tags in physical items, sensors in equipment, robots on the factory floor, corporate back-office systems and smart devices are all linking up to create an environment that is rich with information exchange. Think of it as the Internet of Everything, where connected information, people, places, things, systems and virtual
entities create, consume and apply information for value, providing an environment ready for a
digital edge.\textsuperscript{13}

Digital density is growing as the cost of connecting inanimate objects, people and location continues to fall. Moore's law on processor speed, Metcalfe's law of networks and Gilder's law on bandwidth are rewriting the rules of business. It costs as little as a few cents to provide self-powered chips that can perform some form of elementary communications and processing. Gartner calls this the Nexus of Forces, where new business scenarios emerge as new technologies converge and mutually reinforce each other.\textsuperscript{14}

The business implications are clear. FedEx Ground uses digital cameras, bar codes and embedded sensors to automate its sorting operation, processing more than two packages a second per sorter, using cost efficiencies to expand its addressable market.\textsuperscript{15} In San Francisco, a parking company connected its parking meters so that drivers can find out while driving if and where parking spaces are available. On a personal level, think of a robotic vacuum that checks a smartphone’s calendar and knows to clean the floors on the day guests are scheduled to arrive.

Digital density will make firms “feel” digital. However, they will not become digital businesses as long as they digitally automate processes for efficiency while leaving digitally based sources of customer value and revenue on the table. Other businesses will experiment with digital substitution, creating short-term excitement without sustainable results. Digital automation or substitution is not a strategy; it is simply doing what is possible without considering what is profitable.

A digital edge must be an edge worth having. It must be a performance edge. Fortunately, companies generating greater degrees of digital revenue tend to outperform their industry peers.

A Digital Edge Is a Performance Edge

According to the 2011 Gartner CIO Survey (involving 2,014 enterprises), digitalized businesses have higher growth rates, scale efficiencies and asset effectiveness than their less-digitalized peers. That conclusion is based on a joint analysis of 2010 financial performance by Gartner and the MIT Sloan Center for Information Systems Research (CISR),\textsuperscript{16} which found that on an industry-adjusted basis, firms with above-average levels of digitalization revenue outperform those with below-average levels in three categories:

- **Improving growth rates.** Enterprises with above-average levels of digitalized revenue grew at an industry-adjusted rate of 1.5% above their industry mean. This compares favorably with firms with below-average levels of digitalized revenue, which saw their revenue fall 4.7% in 2010.

- **Improving cost productivity**, as measured by net margin and return on assets (ROA). Net margin of above-average digitalized enterprises was 5.7% above the mean, compared to a below-average net margin of -5.4%. Cost productivity led to an above-average ROA of 1.1%, compared to an ROA of -0.9% for below average digitalized peers.

- **Improving capital productivity**, as measured by return on equity (ROE) and return on invested capital (ROIC). Above-average levels of digitalization had ROE of 3.7%, compared to ROE of -3.1% for below-average peers based on an industry adjusted basis.

These observed performance improvements outline the business potential of gaining a
digital edge.
How to Forge a Digital Edge

The range of digital technologies and the nature of digital density change rapidly. Rather than provide a snapshot in time that will lose its technical relevance, this book explores the business implications of digital technology from a value, revenue and results perspective. It’s a view that corresponds with executive expectations regarding digital investments, because two-thirds of executives responding to the McKinsey Survey expect digital business to increase operating income over the next three years.

How will technology drive growth?

That is the question. Here’s how this book supports developing and executing a digital edge strategy:

The first part of the book provides new ways of thinking about key strategic decisions related to value (Chapter 2), revenue (Chapter 3) and market disruption (Chapter 4). The second part of the book concentrates on selecting the right digital edge model to achieve that strategy. This starts with understanding how to create a digital edge by extracting, infusing and innovating with information (Chapter 5), and then exploring each digital edge model (Chapter 6).

With an understanding of the range of digital models, the focus of the third section shifts to execution and becoming a digital organization. That starts with the new way of building digital capability from the outside in and inside out (Chapter 12). Digital technology requires a diversity of skills and roles and new leadership models (Chapter 13). Finally, Chapter 14 concludes the book with a look at the trends beyond the digital frontier and an action plan for getting started.

What’s clear after studying digital edge businesses and speaking to multiple organizations is that leaders need a new mindset, as well as the techniques described in this book. Revenue left on the table or results that appear only in a spreadsheet are wasted opportunities. Some technologists may see a focus on revenue and value as an artificial limitation on the potential of new technology. But every successful application of technology has a good business reason at its core. Without it, boom leads to bust and great ideas become the answers to trivia questions.

Searching for revenue isn’t the first step. Instead, it’s critical to explore what will drive value for customers and realize new revenue and results. This distinction between value and revenue is one of the key principles in forming a digital edge.
2: Defining Value at the Edge

Follow the leader, particularly when traveling into unfamiliar territory. This is sound advice, but what if leaders go down a path that your company cannot follow? Then the company must define a different path.

We’re all familiar with the leaders commonly associated with digital business such as Amazon, Google, LinkedIn or Facebook. In fact, these firm names have become synonymous with their strategies, leading to plans that call for “Amazoning the market” or “Becoming the Facebook” of an industry. Pursuing a strategy based on mimicking these digital leaders assumes adopting their business models with a focus on exploiting scale efficiencies, generating advertising revenue or offering “freemium-based” products. However, these strategies set a path that many companies find difficult to follow with their established revenue streams, concentrated customer bases and margins that do not allow for giving products away for free.

So what is the digital strategy for those enterprises?

It is a strategy based on defining a new path — one based on building a digital edge by combining the digital and physical worlds rather than substituting one for the other. Those combinations increase the accessibility of new sources of customer value to expand the potential of digital business. Defining value at this digital edge also helps to create addressable revenue that reflects the best of the digital and physical worlds. The process begins with expanding the definition of value in a digital world.

Separate Value From Revenue

Value is often overused and misapplied in business strategy, particularly when strategies refer to value, but the discussion is really about revenue and cost. Companies that equate value with revenue believe that the “moment of value” occurs at the moment of exchange. However, viewing price or cost as a proxy for value limits strategy decisions by concentrating them on narrow financial considerations. There is more to value than cost or price.

Seeing value primarily in terms of “what people will pay for” reduces innovation to a zero-sum exchange between cost and profitability. That exchange defines the path to commoditization. Creating a sustainable digital edge involves using digital technology to realize new forms of accessible value that provide a basis for addressable revenue. Executives need to start with a greater value perspective, and that requires creating some distance between these two concepts.

Create the opportunity for new ideas

Separating value and revenue opens the door to new thinking about how to use digital technologies to achieve new outcomes. Without the room created by opening that door, digital technology becomes just another way to do things faster and cheaper. Companies can use the idea of focusing on the outcome first as a tool to open the imagination to innovative new value sources realized through digital technology.
One way digital technologies make these other values accessible is by allowing customers to recognize value within their natural behavior. For example, Royal Caribbean delivers value within its passengers’ natural behavior by allowing diners to select their restaurant of choice at the time when they are actually hungry. Transport of London helps travelers reach their destinations by providing real time information on operational performance. And what if doctors and nurses could communicate and treat patients within the natural flow of patient care?

**Children's Hospital Los Angeles Found That Patient Value Led to Indirect Revenue**

In 2011, Children’s Hospital Los Angeles (CHLA), a leading pediatric hospital in downtown Los Angeles, California, moved into the Marion and John E. Anderson Pavilion; a new 480,000 square foot, 317-bed hospital that is a $500 million digitally enabled facility. When CHLA embarked on its ambitious building project, it decided to build digital density into the hospital with a primary goal of “improving patient outcomes by eliminating information as a cause of patient harm.”

CHLA didn’t say, “Let’s build a new facility to house more patients and increase revenue,” or “Let’s make sure to digitize all of our patient records because a new facility allows us to build certain technological capabilities.” Instead, CHLA created a goal based on value to the customer — in this case pediatric patients — not financial metrics, staff reductions or revenue. When CHLA targeted improving patient outcomes, it focused on reducing the communication errors that contribute to 70% of patient harm. To solve this problem, CHLA digitized its clinical areas tying all information related to an individual patient into the child’s patient record.

In the new facility, when a patient needs a test, the resources are scheduled, the staffing resources are committed, and everything is scheduled into the patient’s record. The IT team prioritized digital communications to make test results and diagnostic images the highest priority so that when the results are ready; they are immediately available in the patient’s record, and nurses and doctors receive an alert. Digitalization removes the common phrase on television medical dramas, “Is the test back yet?” from the process. By updating physical processes in this digitally dense environment, CHLA not only eliminated patient harm, it freed up 66,000 nursing hours.

A hospital that sought to increase revenue by saving money might have reduced staff. But CHLA stuck to its goal of improving patient outcomes, putting the additional nursing hours back into patient care. The result? Healthier and happier patients and an enhanced ability to win more research grants and attract more world-class researchers because of the volume and quality of high-quality data available from its digital density. In this case the value of improved patient outcomes was readily accessible to the patients and that led to additional sources of revenue based on the value and quality of patient information that generates research grants and attracts top-level researchers.

**Expand the Value Horizon to Match the Expanding Digital Market**

As CHLA’s experience indicates, value flows from the ability to meet customer needs. How an organization sees value and where it sees future potential is limited only by its mental model for customer value. Organizations can expand the value horizon by considering value from new, different points of view.
Consider the limitations of thinking about value in terms of price and performance and how it blindsided the smartphone market. In 2007, Apple released the first iPhone. Critics pointed out that it cost $600 and had no physical keyboard, limited email options, and no copy-and-paste functionality. Clearly from a price and performance basis, the iPhone did not match up. But what was overlooked is that there is more to value than price and performance — in the case of the iPhone, the value of the apps and the personal value of being associated with the product. These sources of value were not recognized or simply dismissed at the time by market watchers and analysts who could not see beyond feature, function and price.

Organizations can expand the value horizon within a strategy by applying new ways of thinking such as:

- Tapping behavior as a source of customer value
- Expanding the scope of value beyond economics
- Innovating value by eliminating contradictions and conflicts

**Tap Behavior as a Source of Customer Value**

Behave! It is an imperative when actions do not meet expectations or fit into an assumed social context. Research into brain and behavioral science highlights the role of behavior in decision making and therefore in business. Digital technology makes behavior an addressable source of value and a consideration in forming digital strategy.

Dr. Susan Greenfield, Oxford neuroscientist and author, describes the changing perspective on value, “I think that we’ve moved on beyond the 20th century goal of more innovative commerce, goods and services where you just own something. What we are looking at is experience-based scenarios where what you are delivering is a product that also comes with a experience, where you feel you’re buying much more than what you’re actually getting.”

Concerns about the influence of technology on how our brains work notwithstanding, technologies such as social media and mobile communications go beyond traditional notions of usability. These technologies enable companies to engage and incorporate customer expression, choice, judgment and action as sources of strategic leverage. Realizing the potential of behavior and digital strategy requires broadening a view of value to incorporate behavior and choice.

**Intrinsic value** comes from how customers look at and feel about themselves. Digital technologies provide a way to deliver contextually relevant information in support of these sources of intrinsic value. Charles Schwab and Co. uses social media to invite an exclusive community of active online traders to share and rate ideas, strategies, opinions and more. This creates a source of value based on how traders feel about their strategies. Digital signage in London and other cities provide bus and train arrival times, giving passengers more confidence and the ability to choose how to travel through a city.

Consider: How will your organization incorporate personal experience, knowledge and preference into the customer value equation?

**Extrinsic value** derives from how customers compare themselves to others. Digital technologies enable companies to go beyond the value of branded or positional goods that consumers believe say a lot about themselves. A U.K. bank demonstrated this with a prototype that allowed customers to evaluate their personal progress against their financial goals compared with others who have similar goals. The prototype combined social
networking and data analytics with the online banking software. The comparison influences behavior and provides a personal experience simply by tapping into how customers look at and feel about their progress relative to others. This source of value is particularly powerful in industries where there is an extensive gap between the time of purchase and the time of value realization, such as with insurance, financial products, exercise equipment, automobile purchases or home purchases.

*Consider: Where do opportunities exist to enhance your customers’ standing with others or give them greater confidence in their decisions and actions?*

Digital technologies provide new choice mechanisms and options for digital strategies. Customers select for themselves, via mobile or tablet computers or even by simply walking into a store. The impact of choice can be powerful in reducing internal complexity and cost while enhancing the external experience. Royal Caribbean’s use of digital signage gives the company real-time information into restaurant capacity and demand while eliminating the need to plan, communicate and handle exceptions associated with prescriptive dinner reservations.

*Consider: How can turning over process responsibilities to individuals simplify your operations, reduce costs and deliver a personalized experience?*

**Expanding the Scope of Value Beyond Economics**

Digital technologies have the capacity to go beyond delivering better or cheaper products and services. They have the ability to create a broader range of value. As customers, communities and societies demand more from companies, products and services, the concept and context of value is expanding beyond simple economic terms of price/performance.

**Economic value**, the type we are most familiar with, is measured in financial returns on the capital invested in a company. Assessed by profitability, cash flow and market value, economic value provides a way to reward investment risk. HFA used digital technologies to make its operations more efficient, reducing costs and improving performance in handling new digital licensing requirements.

**Shared value** exists when both the firm and society benefit from business activity. Described by Michael Porter and Mark Kramer’s Harvard Business Review article entitled “Creating Shared Value,” this source of value comprises the practices that simultaneously enhance competitiveness and advance the economic and social conditions in which the company operates, leading companies to invest in and develop local resources rather than simply exploit them. United Stationers’ use of digital technology to support local customers banding together into virtual vertical businesses provides an example of building shared value from a digital edge.

**Sustainable value** exists when a company enhances its ability to operate profitably into the future, which includes using renewable sources and processes that will not destroy the environment. Characterized by John Elkington in 1989 as the “triple bottom line,” sustainable value is the foundation of efforts to measure the economic, social and environmental impact of a company. SFpark, San Francisco’s digital parking system, creates a platform which goals include reducing congestion, improving air quality and raising safety.

**Personal value** is the value individuals seek and receive through associating with their employers. Digital technology tools change the ways in which people leverage their personal connections and accelerate the pace of work, transforming the employment relationship from
an exchange of hours for wages to one based on providing a platform for employees to achieve their personal goals and objectives. Rabobank's initiative to apply digital technology to "unplug" employees has allowed them to work at times and places that make the most sense, raising employee and customer satisfaction.

Innovating Value by Eliminating Contradictions and Conflicts

Contradictions exist in every business and can be a source of value delivered by a digital edge. Contradictions are the hard spots in strategy presenting either/or choices. Many of these tradeoffs are created by the limitations of physical resources and operations. One way to consider the strategic value of competing beyond a contradiction by being both while everyone else is either/or. That was the disruptive force behind the quality movement as it resolved contradictions between cost and quality in manufacturing and service processes. The contradiction of high-quality product at a low price gave Toyota and Honda an advantage in the automobile market for more than 20 years.

When companies realize how digital technology resolves a contradiction for customers or in their business model, they find an opportunity to create a digital difference. CHLA provides more hours of hands-on patient care in a digital environment. Royal Caribbean passengers enjoy personalized experiences amid thousands of others. In later chapters, we'll discuss additional examples of how contradiction creates value.

Creating Accessible Value

New ways of thinking about value expand the range of value possible through a digital edge. Accessibility refers to the ability of customers and companies to use solution features and functions. Innovation comes from considering how digital technology features or functions push the frontier of accessible value.

Pushing that frontier to its edge starts by realizing that accessible value exists across multiple dimensions, from economics and pricing to ergonomics and physical properties. Digital technologies change the accessibility of new combinations of information, processes, facilities and behaviors that lead to new solutions and performance levels. How customers recognize, select and apply these capabilities forms the crux of customer accessibility and part of a digital edge strategy:

- FedEx Ground uses digital technology to expand its package-handling capacity and efficiency, reducing its costs. It uses that digital edge to expand its potential market by sharing part of that efficiency with customers in the form of more competitive shipping prices.

- United Stationers uses digital capabilities to increase customer and resellers access to its supply chain and marketing capabilities, improving the customer's/resellers' ability to market, sell and serve its end consumer.

- IONX, a developer of ultra-low-power wireless telematics solutions for railcars, uses digital technology to give railroad operators, shippers and others in the transport industry real-time information on railcar fleets and their conditions. This information improves the efficiency and security of railroad operations.
Each of the examples above creates value for the customer either by lowering prices, increasing capability or supporting their operational efficiency. Increased accessibility does not automatically connect with growing revenue, however. Making that connection requires thinking in new ways about revenue addressability and pricing.
3: Creating Addressable Revenue

Creating value is not the same as realizing revenue. The difference concerns executives when they consider the history of technology and revenue. Great ideas can fall through the crack between value and revenue. The prior chapter discussed the need for a digital strategy to expand its value horizon in order to capture the potential of a digital edge. So how does the value made accessible by digital technology become addressable revenue for a company?

Revenue addressability refers to why and how customers will pay for the value they receive from products and services. Revenue addressability has been a sticking point in formulating digitally enabled business strategies. It can be easy for customers to see the value of digital capabilities, but that value does not always translate into increased revenue.

The revenue model of digital leaders reinforces this notion. As discussed in Chapter 2, their revenue models center on scale efficiency, advertising or freemiums. The three are related to each other and to the nature of digital technology. Having an understanding of these revenue models helps companies develop digital revenue strategies that better reflect the realities of their operations.

First off, a digital resource is readily scalable. Our Gartner colleague, Steve Prentice, points out that high transaction costs, due to platform inefficiency or traditional product and pricing practices, have limited the opportunities for these business models, which almost always rely on hyperefficient transaction processing engines capable of great scalability. ¹

The bigger the company, the more revenue it can attract. Frequently, digital strategies concentrate on building a critical mass that provides the basis for digital revenue. Amazon uses a critical mass to generate revenue from product sales on the scale of its catalog and trading partner network. Facebook and Google generate advertising revenue based on attracting an audience of millions of members or clicks. In both cases, advertising revenue subsidizes the customers’ free use of the sites. Freemium revenue models rest on scale efficiencies that allow a company to provide basic services at no charge in the hope of selling revenue-generating premium services. This is the model used by LinkedIn. It supports more than five free customers for every premium-paying customer. ²

These revenue models are viable only if the business has the scale necessary to attract advertising or the scale efficiency to afford carrying the cost of a large number of nonrevenue-generating customers. Few established businesses have these characteristics and fewer want to risk current revenue streams or investments in operations and customer relationships to make the leap to one of these digital revenue strategies. A digital edge revenue strategy creates addressable revenue in other ways. United Stationers provides an example of finding new sources of revenue through digitalizing its business.

United Stationers’ Digital Edge Strategy — Winning From the Middle

United Stationers Inc. (United Stationers), a leading North American distributor of business products, had 2011 sales of $5 billion. The company stocks 100,000 items from 1,000 manufacturers serving 25,000 business product dealers and industrial product distributors.

The advent of e-commerce led a number of suppliers to create direct relationships with their end customers, thus disintermediating the role of distributors like United Stationers. However, United Stationers saw this as an opportunity to increase its value proposition with
its customers. In order to grow, the board and executive team considered the latent value of United Stationers’ digital resources and capabilities, and developed a strategy to strengthen its position between manufacturers and its resellers or to help it “win from the middle.”

“Our emphasis on digitization transformed us by enabling new business services,” said Dave Bent, senior vice-president e-business services. The company created new information and digitalized business functionalities based on differentiated Web search capability, buying experience, enhanced marketing services and effective supply chain operations. These capabilities improved operations and opened the door to digitally-based revenue opportunities as customers used United Stationers’ capabilities to form virtual vertical businesses.³

These vertical virtual businesses blended the strengths of individual customers into a consortium, backed by United Stationers, which could compete for contracts collectively rather than individually. According to Bent, “The virtual vertical business created digitalized businesses able to pursue new revenue opportunities based on competitive advantage, drawing on the best each partner had to offer.”

United Stationers winning-from-the-middle strategy illustrates the hallmarks of a digital-edge-based strategy. Winning from the middle started with new ways of thinking beyond the walls of current business models. Thinking outside its distributor role gave the company a different perspective on its digital resources, customer relationships and value creation possibilities.

Aggregate Business Activity Into Addressable Revenue

Creating a digital edge that results in addressable revenue involves thinking about how to aggregate business activity rather than pricing digital products and services.

It is relatively easy to create addressable revenue for physical products and services. Set the right price and product assortment and put it in the right channel, and value becomes revenue. Applying these pricing rules to digital products and services can reduce the price paid and revenue earned by 15 to 40 percent.⁴ Selling products and services via online digital channels remains an important source of digital revenue, but it is not the only way a digital edge realizes company revenue.

Digital technology provides ways to capture business activity ranging from customer search inquiries to the telemetry provided by sensors and operational equipment. How an organization aggregates or assembles this activity determines how customer accessible value becomes addressable revenue.

Think about business activity across two dimensions — the value of the individual digital transaction and the frequency of these transactions. The two dimensions are relative to each other. The more frequent the transaction, the lower the average value of each transaction; but the greater the value of aggregated transactions. High volume transactions are initiated by and associated with smart machines and devices, such as utility smart meters that read electricity meters 2,880 times a month or cellular phones that provide location telemetry every few minutes all day. Higher-value transactions, such as medical test results or consumer purchases, are less frequent and often driven by individual decisions, actions and behaviors.
A digital edge strategy identifies the different ways in which customer value and business activity aggregate into company revenue. Companies can consider the following general approaches to help translate accessible value into addressable revenue.

**Apply digital technologies internally to generate greater operations efficiencies** that result in revenue either by improving company margins or reducing pricing to expand market share. FedEx Ground leverages its expanded sorting capacity and efficiency to expand its addressable market by competitive pricing. HFA, an intellectual property rights management company detailed in the next chapter, raised its digital efficiency to the point that customers found it more economical for them to hire HFA's back-office processes than provide them on their own. The Automate and Apply digital edge models facilitate these types of revenue.

**Create new information-intensive offerings** that generate a preference or pricing premium in the marketplace. United Stationers generates revenue by providing digital marketing services back to its suppliers. IONX, a provider of digital telemetry for railroads, offers a suite of information-intensive products that improve transportation efficiency and improve railcar management. Analytics turns high volume transactions into valuable insight. This is the domain of the Abstract digital edge model.

**Create a singular environment and unique capabilities and experiences** that enhance another part of the organization’s revenue model. CHLA's digital patient capabilities not only improve patient outcomes but also create a digitally captured clinical database that is an essential resource for attracting research grants and world-leading researchers — both resulting in increased revenue. CDW, a leading provider of technology products and services, achieves the same goal by providing superior service delivered by digitally enhanced account managers.

This is also the revenue strategy outlined by the National Football League: increase ticket sales at the stadium by creating a unique customer experience that cannot be found watching a game on the television or over the Internet. This is the domain of digital edge models such as Accompany and Augment.

These revenue models are not mutually exclusive; they often blend together and build on each other. Royal Caribbean provides a clear example, as the digital edges built to achieve its no-lines outcome results in multiple sources of addressable revenue. Obviously, digital technology creates a unique customer experience, and happy customers tend to spend more. The information generated from those digital capabilities enables the company to personalize offers that not only generate revenue but also fill unused capacity at onboard attractions like the spa, climbing wall, etc. Additionally, the customer experience supports repeat business and referrals, all of which keep the ship operating as close to capacity as possible.

**Create an Addressable Revenue Strategy That Reflects the Reality of Accessible Value**

Executives can be skeptical about the potential of digital resources to generate revenue. They know that they cannot copy the models of digital leaders. Separating accessible customer value from company addressable revenue provides a way for digital technology to lead to innovative revenue models based on information-intensive offerings, a new customer experience or digital efficiency. Each reflects a path available to every organization.
It’s important to recognize that digital technology increases the importance of customer specific context. Organizations can use digital context in their revenue models by acknowledging the value and uniqueness of engaging customers in their own context. Context provides a way to generate revenue premium from truly personalized and customized products. Context enables micro segmentation that allows customer choice to drive and align customer needs with digital edge features, functions and channels. Executives basing digital revenue and pricing decisions on a pre-determined set of universal prices negate the revenue potential of digital context.

Similarly, avoid equating the cost of production with revenue. That way of thinking can lead to underpricing the value of digital edge solutions, particularly when executives compare production costs to legacy product prices or competitive benchmarks. Just because something costs less to produce does not mean it has less value. Likewise, recognize the risk of establishing digital revenue models based on comparing digital products with the past or with peers. This comparison is bound to lead to underpricing for the simple reason that if you do not understand the value of digital content and capability, then chances are others do not understand it either.

These practices help executives recognize sources of potential addressable revenue that arise from a digital edge. They give executives a tool for thinking about digital revenue in new ways as few organizations have the scale required to directly mimic the digital business models of Amazon, Google, Facebook or LinkedIn.

Organizations need to define their own paths to turn digitally accessible customer value into company addressable revenue. That path starts with recognizing the nature of business activities that generate customer value and connecting them with sources of revenue ranging from increased sales to increased resource utilization.

Matching the reality of business activity with different ways of capturing revenue gives a digital edge strategy a solid footing, one based on the unique aspects of each combination of digital and physical resources rather than copying other revenue models. That ability to realize unique forms of revenue gives digital edge companies the opportunity for digital disruption.
4: Creating Digital Disruption

A digital edge can be disruptive. Too often we focus on the victims of disruption — Borders Books, Kodak and other companies that have struggled or folded in recent years. However, having a digital edge creates a powerful tool and response to the technological and market forces that reshape success. Digital technologies create the conditions for disruption by changing economics, access or performance.

Three Dimensions for Digital Disruption

Disruption delays or interrupts continuity. In a business context, disruption upsets the continuity and path of business and technological developments for leaders and puts new competitors on the path. When digital technology is the cause, then it is digital disruption.

Performance disruptions occur when digital technologies deliver breakthroughs in operational performance and customer effectiveness. Digital technology disrupts Enterprise Economics when it changes the nature of transaction units and costs in ways that upset revenue and cost models. Access disruptions are the result of digital technology changing the relationships between how customers, suppliers, intermediaries and others interact.

The different dimensions of digital disruption describe how a digital edge can change the terms of competition. Not every digital strategy needs to be disruptive, but it should be considered as a motivation for the company and its competitors. Companies can create disruption when digital capabilities give them the ability to upset the status quo in terms of performance, economic or access dimensions.

Digitally Disruptive Performance Defines New Standards in the Market

Performance is perhaps the most common and readily recognizable form of digital disruption. New technologies that create better or faster functionality seek to disrupt the competition by changing the performance dimension. Organizations define performance along a range of dimensions from price-performance, or technical measures, to operational and financial metrics, among others.

Performance is relative, as companies tailor specific measures to a specific product, service or industry. For example, automobile performance is measured by miles per gallon, safety or the time it takes to go from 0 to 60 miles per hour. Technology is measured by processor speed, storage capacity, communication speed, weight and power requirements; and some organizations define performance in ways that support their brand or self image.

Digitalization creates new levels of performance by extending the ability and capacity of products and services to fulfill customer needs. The notion of being digital and the value of replacing physical assets is well understood. However, as digital density expands the potential performance profile for products and services, new combinations of information, interaction and context expand the range of digital performance. At the same time, advances in material sciences give products, facilities and equipment new physical and information-based properties. Digital signage, 3D printing and touch sensitivity are just a few advances in material sciences that create performance-based disruption opportunities.

How digital technology raises performance depends on the way it interacts with a company's physical resources. This is at the core of CHLA, where digitalization is concentrated on creating
better patient outcomes by augmenting the performance of clinical staff via information and communications. The combination of the singular set of attractions on board Royal Caribbean’s Oasis class and its digitally based passenger experience creates a performance-based disruption in the cruise industry. CDW uses digital technology to deliver a high-touch customer experience not normally found in the markets in which it competes. We discuss more about how CDW uses digital technology to accompany its account executives in a later chapter.

“Going one better” requires creating like-for-like comparisons. That has been effective for physical products, but in a digital world, customers bundle their view of performance across feature, function and value sets, making direct comparisons difficult. Instead of bettering the current performance of a digital leader, consider creating a bundle that establishes new definitions of performance rather than new performance levels. Changing performance dimensions is one aspect of digital disruption, but digital technology does more than change feature and functions — it can also upset market economics.

**Disrupting Enterprise Economics by Employing Microtransaction Strategies**

Prior to digital technology, a company’s physical characteristics determined its operational capacity, transaction cost structure and economics. The fundamentals of many business models rest in handling high-value, lower-volume transactions; for example, purchasing or leasing an automobile rather than paying by the trip. Product and service bundling became a way of improving company margins on an assumption about transaction costs. If the transaction costs for processing one dollar of revenue are the same as processing one hundred dollars of revenue, then the margin on selling in lots of one hundred is higher. Many bundles involve customers paying upfront and accessing the value over time or holding an inventory of the product within their operation. This is part of the logic behind selling insurance over a term of years rather than months or even days, bundling individual songs into one record, and bundling travel into an automobile purchase or long-term lease.

Digital technologies upset the balance between volume and value as they enable microtransactions that lead to geometrically higher volumes of transactions, with each transaction having a geometrically smaller value. These microtransactions can be too numerous to bill for individually, as the company’s internal overhead cost structure cannot support the incremental revenue of each transaction. This occurs when the marginal distribution and administration cost is above the marginal revenue. Apple’s iTunes store manages this situation by not billing small purchases immediately, aggregating them until the combined value can support the cost of payment processing. Few firms are able to adapt to the realities of digitally enabled microtransactions, and that opens the door to disruption. The Harry Fox Agency is an example.

**HFA Changed its Economics to Meet the Challenge of Disruptive Digital Economics**

The Harry Fox Agency (HFA) is a leading rights management solutions provider for the music industry. Located in New York City, the company was founded in 1927 by the National Music Publishers’ Association to act as a clearinghouse and monitoring service for licensing musical copyrights. Today HFA has more than 46,000 music publishing clients and also works with digital music distributors and service providers.
The consumption of music has evolved from piano rolls, to vinyl, to CDs, and now to digital downloads, sampling and streaming. As the formats changed, so have the volumes, the royalty rate structure and customer needs. In 2009, after the Copyright Royalty Board (CRB) legislation established digital royalty rates, HFA was suddenly faced with an 800% growth in data volumes. Yet, conversely, the royalty value per transaction was decreasing. Up to this point, HFA's business was focused on processing transactions for physical products such as CDs with a royalty rate per track of 9.1 cents and an average of 12 tracks per CD. When the CRB established a percentage of revenue-based royalty rates for digital uses, with each digital use defined as a single royalty event, it changed HFA's entire business.

Processing payments for digital licensing involves exponentially more royalty lines; potentially tens of thousands, and the payment amounts per line are frequently less than one cent. Today's digital license royalty statements may include upward of 20,000 transaction lines that amount to only $100 — as opposed to 2,000 transaction lines for physical products, where royalties amount to thousands of dollars. HFA needed to immediately evolve and find efficient ways to handle the low-value, high-volume transactions while looking to develop new business opportunities as data volumes were growing by 800% and average transaction values were falling — both sure signs of a disruptive force at play in the market.

The company's response was to apply digital technologies to automate digital licensing payment processes. The response turned a back-office payment process into a source of revenue when customers decided to use HFA's solution rather than build similar solutions on their own. The approach has paid off for HFA, with digital services revenue experiencing a 13% year-over-year growth rate.

Companies face two options in response to economic change: fight or flight. The flight option needs no explanation — it's the core driver of the incumbent's dilemma as firms exit lower margin product lines in the face of disruptive new entrants. HFA represents an example of a way to fight back by adapting to changing digital economics. The agency embraced the change, rearchitected its operations and found a way to profitably address changes in the market’s value/volume equation. Fighting back against changing economics requires more than wage or cost cutting. Such tactics can produce short-term results, but more often delay confronting reality until it’s too late. A change in economics creates a structural challenge and therefore requires a structural response.

**Disrupt Access by Changing Distribution and Value Chains**

Access is the oldest and most studied dimension of digital disruption. Called “disintermediation” in the first wave of e-commerce, access disruptions were based on directly connecting customers with suppliers. Disintermediation was intended to mean the death of distributors, intermediaries and brokers. Although some distributors have gone out of business, others have adapted, evolved and disrupted the access dimensions of their industries through a combination of information and services. The persistence of these enterprises indicates that there is more to access-based disruptions than just disintermediation.

Access disruptions victimize companies that believe their value rests in controlling access to products and services. Firms whose strategic value rests in barriers to entry are particularly susceptible to access disruption, regardless of their industry. The idea that companies control access, or territory, in the value network and can exploit that position for profit, identifies areas of potential access disruption.
Consider the book marketplace from 1994 to 2007, where Borders and Barnes and Noble continued to survive, despite the Internet-based model of Amazon. It was not until Amazon went beyond supply chain disintermediation and digitalized books via the Kindle and Kindle reader that the market became fundamentally disrupted. Amazon did not change the nature of books, but it fundamentally disrupted access to them. United Stationers has used its digitally enabled supply chain and marketing services to change access dynamics in the office supply industry.

**United Stationers Used Access Disruption to Create Vertical Business**

United Stationers provides an example of access digital disruption. Its strategy of “winning from the middle” originally focused on strengthening the company’s position between manufacturers and its resellers. The company created new information and digitalized business capabilities based on differentiated Web search capability, buying experience, enhanced marketing services and effective supply chain operations originally focused on each of its resellers.

Then a reseller in California came to the company with an idea. According to David Bent, Senior Vice President E-Business and CIO at United Stationers, “One of our customers, a small office products reseller, successfully competed for a multi-million Public Sector State contract, combining their local presence and services with our ‘white-label,’ or generic, digital capabilities from United Stationers.”

Digital technology also enabled another group of resellers and United Stationers to change the nature of access and open a new market by aggregating local resellers into virtual vertical businesses, with United Stationers providing a unified supply chain and back office. These resulting vertical virtual businesses blended the strengths of individual customers into a consortium. The idea worked as this national consortium of 500 local office products resellers competed successfully, with support from United Stationers for a U.S. public sector contract worth $500 million. The government awarded the contract partly because it found that the consortium offered a unique proposition — supporting small and local businesses around the country while still providing the scale of a national service. This was an aspect some nationwide bidders lacked.

By combining the local presence and services of individual resellers with the scale of United Stationers’ e-commerce capabilities, and procurement and processing functions; the company helped resellers win large contracts that were previously out of their reach. The result changed the nature of access, as local resellers were able to readily compete with national chains.

**Strategies for Digital Disruption**

Increasing levels of digital capability and digital density create new opportunities to change the terms of competition and create digital disruption. Recognizing the impact of technology to change enterprise economics uncovers opportunities to change the terms of competition. Digital technologies change the nature of market access as mobility, smart devices and digitally enhanced channels lead to new product offerings. Finally, digital technology drives achieving new levels of performance through applications that automate previously integrated processes or accompany and augment human performance.
Creating a digital edge requires more than putting technology into the field. It involves creating amplified digital capabilities that blend the best of both digital and physical resources. The right blend of the two creates a digital edge. In Section II, we’ll discuss how to make that blend by extracting information from physical resources and infusing digital information into operations to create innovative digital capabilities.
SECTION II
Select the Right Edge
A digital edge comes from creating new combinations of digital and physical resources, not simply substituting one for the other. Physical resources, or ‘atoms’ as Negroponte called them, include the personnel in the organization, the equipment and communications devices they use, the facilities they work in, the inventory and raw materials, the physical products and services produced. If one can see, touch, smell, or taste it, or it winds up on the company’s balance sheet, then chances are it is a physical resource.

A digital resource includes anything with a chip in it. However, this is a biased definition, emphasizing the physical implementation of technology — the chip. An actionable definition of digital resources includes information, how it’s captured, how it’s processed and the new insight created in that process. The combination captures the essence of digital resources used to create an edge. Examples of digital resources include customer information and history, product descriptions, operational performance, awareness of the current situation, telemetry from sensors, channels, social insights and understanding, analytics, commitments and contracts, designs and other forms of intellectual property, motivations, experiences, preferences, and more.

Bringing physical and digital resources together into a digital edge requires thinking about the relationship and resources that flow between the physical and digital worlds. The process begins by understanding the customer- or process-oriented outcome and then thinking of the set of digital capabilities required to achieve that outcome in ways that lead to digital value. A company forms its digital capabilities by creating innovative combinations of physical and digital resources. To create these innovative combinations, companies must explore how best to extract information from physical resources and infuse that information, and additional sources as well, back into those resources; thus developing a new digital edge. This process is illustrated in Figure 5.1.
Extract and Infuse to Build Digital Capability

Creating digital capability involves extracting two types of information from physical resources. The first, static information, includes descriptions such as characteristics, components and relationships with other resources, and formed the basis of e-commerce. Analytics, master data management and content management technologies extract static information. The second type, dynamic information, includes a resource’s location, its condition (i.e., temperature, positional orientation, exposure to physical shock), pricing, availability, and more. Digital technologies such as sensors, near-field communications, wireless communications and embedded chips extract dynamic information. Extraction is the foundation for e-commerce as companies put extracted information online. Creating a digital capability requires using information to give physical resources and other data new performance and value characteristics. Those characteristics come from infusing information back into the physical world.

Infusion creates new capabilities by driving information and digital resources back into physical resources. The resulting combination forms the basis for a digital edge because it connects previously isolated operations and makes dumb resources smarter. For example, infusing location, patient, scheduling and test information into the medical equipment at Children’s Hospital of Los Angeles not only raises its utilization — everyone knows where the equipment is and what it is doing next — but also plays an important role in eliminating information gaps as a cause of patient harm. A range of technologies, including mobile and tablet computing, digital signage, remote sensing, analytics, software as a service, social media and broadband communications, make infusion possible.
Innovation comes from the resulting capability and its ability to create the desired outcome. The innovations in terms of customer experience, company operational capabilities and operational performance discussed throughout the book illustrate some new answers to achieving outcomes based on creative combinations of digital and physical resources. The process of blending the two to create innovative solutions is the focus of Chapter 12.

The IONX Solution Provides Continuous Information About Rail Car Status

To illustrate extraction and infusion, let’s consider one scenario: rail cars. The vast majority of the more than 1.5 million railroad freight cars in the United States — a significant part of the national supply chain — run in “radio silence.” Railroad operators assume they know where they are, what they carry, and their status based on shipping and train-dispatch records. The railroad periodically (and manually) verifies rail cars when they move to a siding or reach their destinations.¹

In 2008, Amsted Rail Company started a subsidiary, IONX, headquartered in West Chester, Pennsylvania, to develop machine-to-machine (M2M) remote tracking and condition-monitoring solutions for freight cars, locomotives, ISO tanks, containers and chassis. The systems use both satellite and cellular communication technologies to extract and infuse information into the previously “silent” system, opening the door to innovative approaches to rail distribution and commerce (for example, using rail car telemetry as a trigger to invoicing and payment processes).

The initial outcome for developing the IONX system was “monitoring what we make,” according to Mike McDonnell, chief technology officer of Amsted Rail. To achieve this, IONX created a digital capability to pinpoint a freight car’s location, its operating condition and the condition of its cargo. This, in turn, differentiates IONX’s and Amsted’s products from competitors because an IONX digitally enabled rail car enhances railroad safety, improves rail car utilization, reduces operating capital requirements, and improves regulatory compliance and supply chain operations.

To achieve this, IONX deploys a combination of digital and physical resources to create value at the level of both the rail car and the entire railroad operation. At the rail car level, sensors attached to the rail car provide real-time knowledge to the railroad via wireless, GPS, RF and satellite communications. Each rail car can have multiple sensors within and outside it, creating a hub for a mesh network of sensors providing comprehensive information on conditions such as temperature, weight, movement and pressure, and others that monitor types of cargo, such as liquid, volatile or refrigerated. Due to the harsh environment, sensors are rugged and self-powered (including solar-powered units), requiring no structural modification of the rail car or the communications network.

A smart rail car is only valuable if it can infuse information as part of a digitally enabled railroad. IONX has created digital technology that works within the real constraints of current rail operations. Its remote sensors attach to existing rail cars, use existing communications infrastructure and provide information that feeds existing operational systems. This is a marked departure from other digital applications that require creating specialized environments for digital technology.

Realizing these capabilities within the limitations of current rail operations required building additional digital capabilities that leverage sensor data into specific operational value and revenue.
IONX services include rail car asset-monitoring systems that provide analytics and dispatch support. Additional services link rail car information with ERP systems to track assets, handle billing and automatically generate bills as rail cars are offloaded. The company provides these services via a cloud service model that enables railroads to incorporate them quickly and efficiently.

IONX’s combination of digital technology at the rail car level and digital services across the railroad create customer value by impacting related business processes such as:

- Improved fleet management, as enhanced information on rail car status creates new capabilities to address safety, security and cycle time performance more effectively
- Better asset management and utilization owing to asset location via GPS, and dynamic geofencing-based reporting
- Improved operational safety, because the rail operator and customer can monitor ride quality, speed, disruptions and other factors
- Increased operator ability to comply with regulations and reporting requirements
- Improved equipment availability and uptime, since the sensor network monitors critical conditions (e.g., temperature and physical status)

IONX found the right digital edges to create customer value and company revenue. In this case, the company applied digital sensor and communications technology to give each rail car a “voice.” The company automated the processing of digital resources to give its railroad customers the tools to turn information into value.

**Innovation Amplifies Digital Capabilities**

Inanimate objects are not the only properties that can be extracted and infused. Location-based services such as Square’s Pay with Square represent another source of digital capability. Square uses GPS to detect individuals shopping in a store and presents their photos on a cashier’s iPad Register app. When a customer is ready to pay, she simply states her name and the cashier immediately debits her account. No cash is handled in the transaction. The digital essence of the customer — her photograph — is infused into the retail process to create a digital capability, thus amplifying the cashier’s standard process.

Innovation leads to further innovation as digital capabilities access and act on digital information to create new sources of value. For example, because Pay with Square can detect shoppers in a store, it can also detect them in the general neighborhood and draw them into the store with promotional offers. Similarly, Royal Caribbean captures an authenticated digital image of each customer’s face when passengers initially board the ship. This image is part of the digital platform. This is part of a “happy surprise” phenomenon observed in a number of case study companies profiled in this book — digital innovations built on each other in ways that could not be predicted in the digital strategy.

**Five Models of a Digital Edge**

Extract, infuse and innovate represent the model for creating digital capabilities through new combinations of physical and digital resources. Categorizing the infinite range of technologies and possible combinations into a finite set of models requires distilling different models into their most
fundamental elements. Rather than classifying the elements by type of technology — mobility, big data analytics, social media, etc.— that change rapidly; the model describes the relationships between physical and digital resources. Those relationships describe different digital edges shown in Figure 5.2. This graphic, introduced in the first chapter, displays the five different models.

**Figure 5.2 Five Models of a Digital Edge**

Graphical attempts to categorize the diversity of potential digital solutions are bound to face limitations. Figure 5.2 provides a graphical listing of the different types of digital edge in terms of the relationships between digital and physical resources. Although these models build on one another, they are not intended to represent increasing digital maturity.

The arrow highlights the resource at the forefront of a digital edge. For example, in the Automate model, digital technologies are the primary source of competitive value. In the Accompany model, digital resources support physical resources. The Abstract model rests on a “digital on digital” relationship reflecting the creation and application of derivative information. Facebook is an example of this model, as it creates value from building information from individuals into more valuable aggregate information, which it calls the human graphic. Royal Caribbean’s use of information to shape individual behavior and decisions that collectively shape everyone’s experience is another example of this solution. Figure 5.3 summarizes the description of each model.
A digital edge rests on more than the relationship between physical and digital resources. Organizations can achieve similar goals with different types of digitalization. However, each type reflects a particular focus on strategy planning, customers, operations or financial impact. Mapping these focus areas to the different models creates a map that helps identify the opportunities and applications of digital capability (see Figure 5.4).
These digital models represent a mosaic, not a monochromatic solution. Firms creating a digital edge will use the models in combination to achieve their strategy. For example, IONX’s digital solution incorporates solutions based on the Automate, Apply and Abstract models. The specific boundaries and positioning of each digital capability solution in the map illustrate, rather than prescribe, each model’s impact on the organization. Use this positioning to help select the right model to achieve each outcome in the digital strategy.

For example, FedEx Ground’s need to increase the efficiency and capacity of its package-sorting processes may be best met by starting with an Automate model of digital capability. Select a model as a starting point for each of the major outcomes within a digital strategy, then adjust as necessary. Figure 5.5 translates this map into specific directions as to which models are best suited to achieve the outcome based on the required focus.
Creating a Digital Enterprise Platform That Supports Each Type of Digital Edge

An effective digital strategy uses different types of digital edge to achieve its intended outcomes. In that regard, the different models of a digital edge represent a pallet of colors that come together, through the strategy, into a digital picture of the organization’s digital capabilities. That digital platform, outlined in Figure 5.6, represents the structures an organization uses to create value and revenue via digital technology. The digital platform supports the enterprise and every type of digital edge. The model summarizes the structures involved in creating a digital organization. Like any model, it is subject to change in the face of new technologies, so consider it as a guideline rather than a hard and fast inventory or list.
Use Figure 5.6 to set your organization’s digital strategy. An enterprise digital platform covers the range of structures involved in a digital organization, regardless of their source. In talking about this digital platform, Hung LeHong, vice president, Gartner Research, pointed out that it is important to recognize that parts of the platform will not belong to or be controlled by the company. This point goes beyond simple notions of outsourcing or contracting with suppliers. For example, where customers previously carried out self-service activities on company-supplied equipment, they will increasingly perform the same tasks using their own devices or even third-party applications. A digital platform therefore bleeds out of the enterprise’s four walls and into the consumer’s/citizen’s/employee’s personal platform, particularly in terms of the structures involved.
in achieving customer outcomes — the interfaces, devices and channel platforms. Companies do not have to build these platforms, a benefit, but they still need to architect them.

**Explore the Different Models of a Digital Edge**

The models of a digital edge provide a starting point for the design and deployment of digital capabilities that create customer accessible value and company addressable revenue. These digital capabilities extract information from physical resources and infuse it with other information into innovative new solutions. IONX provided an example of the range of solutions required, from remote sensors to analytics solutions to software delivered via a cloud-based model. This is a great example of building a digital edge. The next five chapters explore each of these digital edge models, provide additional examples and describe how to create a particular type of digital edge.
6: Automating With Digital Technology

Paying bills electronically, listening to music online and connecting via social media are forms of digital automation. Automation is the most common form of digital edge as new technologies raise performance by updating and upgrading processes, practices, channels and operations. Automation upgrades back-office, support and operational technologies without requiring companies to change their business process, rules or other physical resources. Figure 6.1 illustrates how an automating model involves digital resources backing up physical processes, practices and operations.

Figure 6.1 The Automate Model for a Digital Edge

Most organizations are familiar with digital automation of back-office processes, with CIOs reporting that, on average, 58% of their current business processes leverage digital technology.

According to respondents, digital automation is prevalent in financially oriented back-office processes, where the reported average exceeds 70%. Front-office processes supporting sales, marketing and market testing reflected a combined average level of 48%. This lower, but not insubstantial, level of digital automation of business processes indicates that some degree of digitalization already exists in the economy.

Digital automation is not limited to back-office automation technologies now that the new generation of mobility-enabled, cloud-based solutions with big data analytics are changing the way companies work. Digital automation now extends into our daily lives from the way we bank via solutions like Citibank’s PopMoney to the way we travel with automobile telematics supporting automated toll collecting (i.e., E-ZPass) or remote driver assistance such as MyFord Touch technology. Each of these new automated solutions represents increased performance without requiring significant process change — a defining characteristic of digital automation.

Digitally Parking Your Physical Car

The digital parking solutions emerging in many cities provide an example of digital automation. Digital automation has upgraded street parking in cities such as San Francisco, Sacramento,
California and Copenhagen, among others. Sensors and smart meters monitor each parking space and publish its status via open source data feeds available to the public. Authorities and others are free to use this information in websites, mobile apps and navigation systems to provide location and time-sensitive information and make parking easier and more convenient to find.

Digital technology enables parking authorities to adjust their pricing in response to parking demand. For example, SFpark charges the lowest possible hourly rate to achieve the right level of parking availability. Parking rates increase in areas and at times where it is difficult to find a parking space until at least one space is available most of the time. Parking rates decrease in areas where open parking spaces are plentiful until some of the empty spaces fill.

Digital automation supports the payment process either by texting the parking location via a mobile phone or by deducting parking fees via near-field technologies found in automated toll tags. For city parking meters, drivers receive warnings via a mobile phone that their time will soon expire, giving them an opportunity to text more money into the meter and avoid parking tickets. The same information conveniently alerts parking enforcement authorities.

Digital parking represents a digital edge and achieves the goals of raising parking efficiency, reducing urban congestion and pollution, and encouraging the use of public transportation alternatives by exposing the availability and cost of parking. Digital information makes customer value accessible as they use parking information to make travel decisions. Parking authorities realize addressable revenue through the increased use of available parking spaces, premium pricing and digital fee collection; replacing physical operations and expensive parking ticket collections.

**HFA Uses Automation to Turn Back-Office Operations Into Front-Office Revenue**

HFA, the music rights provider discussed in Chapter 4, used digital automation to deal with economic disruption. Addressing this challenge not only required HFA to re-engineer its business, but it also created a new source of revenue. As discussed previously, HFA’s economics basically inverted in support of digital rights management payments. A business that was initially based on low-volume, high-value transactions became a high-volume, low-value business where the average transaction was valued at $100.00 and consisted of several thousand line item payments. In response, HFA created new applications, re-implemented functionality, moved to a new calculation engine for royalty rates and enhanced its processing platform to support digital licensing. The company now handles more data in a month that it managed in an entire year before digital licensing.³

But HFA didn’t just realize efficiencies to meet the needs of digital rights management. It was able to leverage its internal royalty-processing capability as a source of external revenue for new digital music distributors who wanted to “lease” HFA’s digital capabilities rather than build their own. HFA created new products and revenue streams as it realized that the work it was doing for itself could also become a back-office platform for others needing to license digital content. Realizing new digital products required repositioning IT within the company. IT now has a role in sales, marketing and evaluating customer requirements. IT is at the table when the company considers the market and opportunity costs of bringing new customers onto the digital rights payment platform across all of the major customer touchpoints such as: relationship management, information management, reporting, payments and distribution and customer support.
HFA’s digital automation gives the company the ability to respond quickly, in as little as 24 to 48 hours, to changes in digital markets. For example, HFA signed a deal on a Thursday to handle the digital licensing, administration and management processing covering 10 million songs for an international licensee, successfully launching on that Monday — a period of four days!

HFA’s experience demonstrates how digital automation not only raises technical performance but also creates opportunities to generate new revenue. HFA’s digital edge is based on handling the contradictions and challenges of shifting from a business based on high-value, low-volume transactions to low-value and high-volume. Rather than deal with that contradiction on their own, customers access the value of HFA’s digital capabilities through new licensing deals, creating a new source of revenue and a new way of managing technology.

Because there is no traditional ROI for these changes, the business case is made based on market opportunity and the need to get new products and services into the market. That approach has paid off for HFA, whose new customer base has grown by 20%, with associated digital revenue exceeding the plan by as much as 18%.

**Performance Is the Goal of Digital Automation**

Pushing the performance frontier is the business goal and outcome associated with digital automation. Digital technologies like remote sensors, open source data, cloud computing, analytics, mobile applications and smartphones create digital technologies that amplify the capabilities and performance of physical resources.

Digital automation uses performance to resolve contradictions resulting from gaps in information, human activity, connectivity or coordination. Parking spaces become active participants in a city’s transportation system. Back-office systems become front-office sources of revenue. Having the capacity and ability to handle high transaction volumes moves from being a cost to a source of advantage.

Digital technology amplifies customer access when new technology gives them new tools to perform familiar tasks. The resulting increase in performance, convenience and information enables innovative revenue models such as congestion pricing for parking, new services revenue or greater levels of operational efficiency. These improvements form the basis for innovation through automation.

**An Automation Edge Rests on Transactional Technologies**

Digital automation represents the latest progression in a 30-year investment to turn manual processes into automated and integrated transactions. Creating an edge based on automation reflects the capacity and efficiency of a range of transaction-processing systems from ERP through sales force automation and CRM and supply chain management. Cloud, advanced communications and increasing smartphone capabilities support the scale and capacity of these automation technologies, which form the core of IT investments and operations.

Digital technologies enhance transaction-processing capabilities, providing new operational and customer channels that build on current direct and Internet-based channels to extend to mobile, location and contextual channels. Future investments in digital automation will have strategic objectives concentrating on greater consolidation, integration and processing efficiency that not only represent an edge in their own right, but also underpin the other types of digital edges.
Automating Amplifies Performance Without Distorting Business Models

Digital automation sharpens a company’s digital edge by honing performance, removing weaknesses and increasing operational capacity. The result is new capabilities and new ways of realizing customer value and revenue without destroying or distorting the company’s core value proposition or strategy.

Select automation as the source of a digital edge when building a digital edge based on raising the performance within the boundaries of an existing business model. Working with an existing model gives direction and structure, and reduces the risk of digital automation by amplifying established products, processes and operations that define the rules and economics of automation. In this regard, building an automation edge involves substituting digital processes for physical resources and operations.

Automation can lead to new sources of revenue, as illustrated by HFA’s experience, particularly when demands for digital-scale efficiencies transform cost or revenue structures. Consider automation as a way to engage external customers in terms of eliminating routine or procedural processes from the customer experience. Royal Caribbean’s use of kiosk technology when initially boarding the ship captures information once and then automates its use through the onboard experience. This can improve the customer experience, but often also supports other digital solutions in an overall customer experience.

A digital edge based on automation is foundational to the other types of digital edges. Automation provides the operational and infrastructure support needed to manage the data and transactions generated from other forms of digitalization. Digital automation manages the information flows and analytics, keeping passengers informed on Royal Caribbean’s Oasis-class ships. It supports testing, patients, results and other operational processes at CHLA. It is the engine of commercial capability and supply chain operations at United Stationers and CDW, discussed in later chapters.

Automating with digital technology describes a type of digital edge that concentrates on internal process efficiency applied in ways that strengthen current business models. It is the dominant form of digitalization in most organizations, supporting back-office operations, and is a growing source of advantage as automation moves into the front office.
In August of 2012 Google’s fleet of a dozen autonomous (driverless) cars reached a milestone by driving 300,000 miles with no accidents. The autonomous cars drove in Nevada and California. If you’ve driven in Las Vegas or the Bay Area of California, you can appreciate the significance of this milestone.

Digital autonomy is an example of applying digital technology to replace physical assets. Other examples include smartphones replacing laptops, mobile apps replacing websites and digital connectivity replacing the need for physical facilities. Each provides an example of how digital technology creates an edge by displacing and changing physical resource requirements. This represents a different digital-to-physical relationship and business focus, as shown in Figure 7.1.

**Figure 7.1 The Apply Model of a Digital Difference**

Applying digital technology does not necessarily require replacing people with machines. Rather, the Apply model seeks to create value by using digital technology to give an organization and its customers new abilities, greater capacity or higher levels of performance, often in the form of new ways of working and types of solutions. Two case examples illustrate the Apply model in action. The first highlights how digital technologies were applied to change the working environment at Rabobank in the Netherlands. The second case projects the use of autonomous equipment in the mining industry.

**Rabobank Uses Digital Technology to Unplug People**

Rabobank Nederland, the central organization for the system of cooperative banks in the Netherlands, has 9,500 employees; the worldwide Rabobank Group has 59,000. In 2006, the bank started a program called “unplugged,” using digital technology to create a new combination of customer relationships, associate work practices and facilities.
Rabobank’s move to a new corporate office in 2006 created the opportunity to address developments in how people work and how customers expect to interact with their bank. The program encouraged employees to define for themselves how, when and where they would work; taking responsibility for achieving their goals with minimal rules and strictly defined processes.

Digital technology connects customers with bank associates and associates with each other. Employees plug into the bank via wirelessly connected smartphones, laptops, video conferencing and other unified messaging applications. Unplugging them from the need to be in a bank building raises customer service — bank associates are free to meet with customers at the most convenient place and time by leveraging Web-enabled applications and tools.

Implementing the unplugged initiative required more than handing out digital devices. Jeffery Mann, vice president, Gartner Research, observed that the bank rearchitected its office space to create varied work environments in support of the different types of work customers perform while in the bank. Unplugging associates also involved upgrading behaviors and business processes based on building trust among associates, for example, by implementing self check-out in the company cafeteria and eliminating internal cross-charging, for participating in cross-departmental projects.

More than 90% of Rabobank’s associates voluntarily participate in the program, effectively defining unplugged as the way the bank works. Applying digital technology to transform how the bank works has created a performance edge — the bank has already reduced its real estate requirements by one-third and is moving toward cutting it in half. The bank also uses 30% less paper, has reduced interoffice travel via video conferencing, has increased associate satisfaction and receives greater customer satisfaction ratings.

**Autonomous Mining Applies Digital Technology to Enhance Safety and Availability**

Large-scale surface mining is a hazardous industry and highly profitable when operated effectively. Now, the density of digital technologies creates the opportunity to move people out of harm’s way and create an autonomous mine operation. Rio Tinto, one of the world’s largest mine operators, defines autonomous mining as the operation independent of human supervision. Autonomic drilling, loading and transport are all coming online as mining equipment grows smarter through the use of visual, laser, accelerometer, geospatial-based location and other sensors. The sensors are connected continuously and in real time via a high-capacity wireless communications network.

Autonomous operations provide the promise of placing fewer people in harm’s way, reducing errors and accidents attributed to fatigue while increasing mining capacity and capital efficiency. The potential for increased operational efficiency creates value by reducing operational capital requirements, and improving operational efficiency, and production capacity. The autonomous mine and other forms of autonomous operations provide examples of the emerging applications of digital technology.

**Applying Digital Technology Changes the Tools of Business Activity**

Digital applications change physical resource requirements. This differs from digital automation, discussed in the previous chapter, in which digital technology improves the performance
of existing activities. Digital automation has limitless potential as technology changes the informational, operational and even physical dimensions of business activity.

Applying digital, however, involves displacing the physical. Consider this example from the airline industry: Jetstar, a subsidiary of Qantas, launched a new service in late 2011 when it purchased 3,000 iPads, preloading them with media content for flights within Australia. American Airlines went a step further, allowing passengers to use their own devices to access audio and video entertainment over an onboard wireless network. Passengers rent television shows for $0.99 and movies for $3.99. Cathay Pacific Airways, estimating that it will reduce the weight on its long-haul aircraft by at least one ton, is planning for the deployment of a similar type of application, reducing fuel consumption and creating a new source of revenue from customers purchasing the content they want rather than watching the plane’s preselected programming.

**Applying Digital Technology Creates an Edge by Changing the ‘Physics’ of Business**

The Apply type of digital edge creates new revenue channels and processes as digital resources change physical requirements. Implementing digital technology in this way resolves contradictions between physical presence and business performance. Rabobank employees no longer need to be “in the office” to create value. People no longer need to risk their safety working at a surface mine, and airlines no longer have to carry the extra weight of proprietary systems when consumers bring their own devices.

These examples illustrate how digital technologies create new delivery channels to make value directly accessible. Channels realize revenue and results in two ways. First, digital delivery channels directly generate and collect revenue through digital products and services (as with mobile apps or American Airlines’ Entertainment On Demand rentals). They also raise workforce productivity and satisfaction. In addition, the near 100% uptime and availability of digital resources provides a consistent stream of operation, reducing cost and capital requirements.

**Applying Digital Technology Can Require Changing the Operating Environment**

Applying digital technology requires reconciling a fundamental issue — the relationship between digital technology and its environment. On the surface, applying digital technology appears as a simple matter of substitution — replace a human driver with an array of sensors, or remove people from a package-sorting line with a combination of bar code scanners and pneumatic sorting machines.

Most applications of digital equipment occur in environments like factories that are highly controlled and where the environment is made to fit the requirements of the technology (for example, unique requirements for temperature and humidity or communications protocols). These environments are often separate from other production and operations facilities, making the application of digital technology a discrete event. This is the case to date with most autonomous technology, creating two environments — a “greenfield” for digital technology apart from the “brownfield” rest of the world.

Consider technology applications that work with and within the realities of the world. Rabobank, for example, applied digital technologies to unplug the workforce in ways that integrated rather than segregated physical and digital work. Google’s autonomous automobile
is another example. Originally planned to work as part of a smart environment complete with embedded road sensors, Google eventually and incrementally adapted its autonomous technology to work in the current road environment.

The benefits of creating capability that works within current constraints are obvious — lower implementation costs and increased flexibility, among others. However this is a consideration that is easily missed when exploring the use of advanced technology.

**Apply a Digital Edge When the Outcome Is Best Delivered by Using Digital Technology to Replace Physical Resources**

The range of situations for selecting a digital edge based on the Apply model is broad. Digital technologies can create opportunities to generate new sources of revenue, as illustrated by the airline examples. Think about the Apply model when digital technology is essential to delivering a new value proposition or business model, a situation often associated with content- and information-intensive offerings. Also consider applying digital technology when it is possible to replace rather than automate existing operations and processes with digital technologies (which is driving interest in autonomous technologies).

Capital investment, operating costs and infrastructure requirements can escalate the cost of applying digital technologies in specialized environments. Look for alternatives to applying digital technology in situations where there is a concentrated focus on reducing costs that might be better met through increased automation or traditional re-engineering. Likewise, recognize the limitations of applying digital technology within a current business model that is a brownfield environment.
8: Accompanying Digital Resources to Support New Experiences

Raising the effectiveness, capacity and sophistication of the customer experience is the most common goal for implementing digital technologies in ways that accompany existing physical resources. This digital edge relies on the use of digital technologies to provide information, automation, analytics and integration support across the organization’s channels, products and services.

Digital technology accompanies human resources to facilitate integrating channels and physical operations, giving an organization a level of customer service integrity. This is critical for customer-facing roles required to know just the right things about customers at the right time to deliver superior service. The alternative is to require customers to navigate and re-initiate their experience every time the company transfers a call or a customer navigates across channels. Capabilities of this type, where digital resources accompany physical activities, generally concentrate on improving the customer experience and performance within the outline of the existing business model, described in Figure 8.1.

Figure 8.1. The Accompany Model of a Digital Edge

Digital technology plays a central role in creating a customer experience edge. With more than 90% of U.S. consumers online, many now access the Internet through mobile devices, social media, online chat and other real-time communication channels, according to a report by J.D. Power and Associates.¹ Digital technology has increased customer expectations about their experience, according to this report, as more customers demand real-time response and one-contact issue resolution.

CIOs and business executives recognize the role of technology in the customer experience — they ranked it as the greatest area of opportunity for technology innovation.² Technologies such
as social media, big data analytics, digital marketing and mobility represent digital resources that frequently accompany and integrate company channels.

**Digital Technologies Accompany CDW’s Account Managers and Channels to Offer a High-Touch Experience Rather Than Commodity Services**

CDW uses digital technology to accompany the abilities of its account managers and provide a high-touch experience to smaller businesses, giving them the same level of service, relationship and selection expected by large corporate companies, at a profitable price.

CDW is a leading provider of technology products and services to business, government, education and healthcare. Founded in 1984 and headquartered in Vernon Hills, Illinois, the company is ranked No. 32 on the 2011 Forbes list of America’s Largest Private Companies and No. 270 on the FORTUNE 500. CDW offers in excess of 100,000 products from more than 1,000 technology brands. At the close of 2011, the company had more than 6,700 employees and sales of $9.6 billion.

Conventional thinking was that it isn’t practical to offer high-touch service, as the cost would require higher profits and larger volumes that were only available by serving large corporate customers. The small and midsize market is diverse and hard to aggregate and individual customers place modest-sized orders. CDW’s competitors’ approach to the midsize market was to match the cost of the channel with its presumed revenue and earn the profitability best suited for first-generation Web portals, online catalogues, digital ordering and customer service oriented toward resolving errors.

CDW addressed the market differently. It realized that midsized and smaller companies value high-touch service more than their large corporate counterparts, which often have expansive IT departments to manage technology. The market was there if CDW could find a way to resolve the contradictions required to bring high-touch service to the middle market.

The company found an answer by unifying the customer experience and building it around knowledgeable account executives across 15 different communications channels. Unified communications route every customer-initiated interaction to the same named account manager. This gives customers contextual consistency in their interactions and provides account executives with the ability to form deeper relationships with their customers. Web services provide each customer with a customized view of the product catalog, presenting information according to their individual profile and integrated with procurement systems and operations.

CDW went a step further by integrating the supply chain with customer-facing technologies to provide order transparency, including serial numbers, product configurations, software imaging and registration for product warranties in the shipping process. The digitalized supply chain optimizes fulfillment for the company in the 35 million units it ships annually. The supply chain is part of the customer experience, as shipping optimization provides its more than 250,000 active customers with full visibility to their individual orders.

“We apply digitalization throughout our processes and operations to connect with customers, demonstrate our performance and inspire customer confidence in that performance,” explained Jon Stevens, senior vice president of operations and CIO. For CDW, digitization is more than moving information around an organization; it means integrating information, processes, facilities and customers in new ways.

SECTION II  CHAPTER 8
CDW demonstrates how digital technologies can deliver a different experience by supplementing the role of account managers and the supply chain to meet the substantial customer service, coordination and synchronization demands required to keep costs under control for customers, suppliers and the company.

**Accompanying Technology Expands the Customer Experience**

“Tiffany service at a Target price” is one way of summarizing the potential of a digital edge built on the Accompany model. That requires being easy and effective to do business with by removing internal complexity from the customer interface to generate more accessible customer value. The value of that experience translates into revenue in ways one would expect, such as increased customer loyalty, rising average order sizes and increased order frequency.

In addition, the digital technologies that accompany the customer experience generate new sources of revenue when data captured in customer interactions provides content of interest to multiple parties across the value chain. United Stationers, for example, uses aggregated customer search, selection and purchase data with its manufacturers. The information creates a source of value as it drives digital marketing and merchandising services.

What’s important to note is that when digital technologies accompany physical activities and resources, they evolve the customer experience from one based on compliance with predefined standards to one anchored in digital customization and human adaptability. Furthermore, digital technology broadens the customer experience, encompassing the entire value chain. Digital technology enables an extended definition of the customer experience. Extensions include delivering on the customer’s definition and expectation of value, encouraging their ability to express themselves throughout the experience, recognizing customers in their context and ability, and supporting their ways of working.

Digital technology facilitates this evolution by making activities simpler through process integration, using channel unification to keep back-office issues out of sight, data contextualization to treat each customer as if they are the only customer at that moment in time and, finally, to eliminate arbitrary rules, policies and deadlines not consistent with a company’s brand, features, functions or promises. These factors are not new, but were lower priority when customers were forced to transact business via the company’s interface and on company terms. Digital technology has given customers choice and voice. Because of this, companies should assess how digital technology can accompany existing operations to create and sustain a new customer experience.
Technology in its broadest sense exists to augment human abilities and capacities. Augmentation is not new. Simple technologies, from a walking stick to today’s use of robotic prostheses, ultimately support people and societies. Digital technology augments physical resources to create new capabilities that transform their operations. This places digital resources at the forefront, where digital capabilities enhance the performance of physical resources and the experiences of customers using these resources.

In the Augment model, digital technology preprocesses information and provides communications and integration services that raise the awareness and performance of human resources. This is different from the Apply model, in which digital technology replaces physical resources. Figure 9.1 describes augmentation and its relative position with the other models.

**Figure 9.1. The Augment Model of a Digital Edge**

Augmentation solutions concentrate on digital technologies that improve human capability, performance, or the experience of customers, partners or employees. Augment sits at the center of the Digital Models Map to reflect the diversity of applications and the roles people play in business performance. Augmenting with digital technology amplifies human performance, but it does not replace it. The Apply model and the example of autonomous mining, on the other hand, represent the models for using technology to directly replace people in production processes.

Technologies such as smartphones, laptops, and tablets provide devices that deliver information and keep people connected. Solutions that incorporate location into their processing or situational awareness bring together information from sensors, processes and more to augment a person’s understanding of the current context. Advanced communications and data capabilities support these applications and keep these devices connected and aware. Taken together, device, application, communication and data technologies transform the work environment to elevate human performance. The implementation of digital technology at the Copenhagen Airport and Children’s Hospital of Los Angeles provide examples of this type of digital edge in action.
**Copenhagen Airport Applies Digital Technology to Augment Passenger and Operational Abilities**

Our Gartner colleague, Mark Raskino, captured an example of digital augmentation in his review of the Copenhagen Airport. The airport serves the capital city of Denmark and competes for traffic with London, Paris, Frankfurt and Amsterdam. Because it will never be as physically large as those airports, Copenhagen Airport needs to differentiate itself in a way that attracts passengers beyond offering more flights and larger facilities. The airport uses digital technology to augment passenger and airport operational staff to create that difference.¹

Copenhagen Airport provides personalized airport navigation and augmented-reality applications to help passengers find their way. Accessed through passengers’ mobile phones, the application uses their flight numbers to send information about the flight and help them navigate to their gates using a compass analogy. A passenger’s gate number hovers over a live video image on the phone when the passenger holds it up to get her bearings.

The navigation app uses GPS and accelerometer information to know where the passenger is and a magnetometer or compass feature to know in which direction she is heading in the airport. This same functionality also assists passengers in finding specific retail outlets or facilities. The value of this type of solution comes into focus considering the clutter of physical signage at most airports, the number of passengers who may be unfamiliar with the airport, and the unfamiliarity with either the Danish or English languages.

Passengers and their movements are another resource for augmenting the airport experience in Copenhagen. Traveler flow mapping and analysis help airport managers understand flows by having real-time information on passenger traffic patterns. This application monitors signals from passengers’ Wi-Fi devices as they walk through the terminal. The airport’s 600 wireless access points monitor each device’s unique machine address, constructing a real-time database of passenger movements around the airport estate. Ten thousand unique device movement paths are captured daily and monitored anonymously to provide to airport operations managers a live 3D map view of the terminal buildings, passenger activity levels, queues, pinch points and other factors. Managers use this information to demonstrate how the airport’s layout and passenger flows provide rapid egress (airline concern) and valuable footfall (retail concern). This helps optimize business decisions such as rents paid by retailers, because the airport can show actual passenger traffic flows rather than relying on surveys or retailer impressions.

Additionally, airport managers can use the wealth of captured information on passenger traffic to simulate their movements, identify chokepoints, measure dwell times and spot the movement patterns of behavioral groups by cluster analysis of walking paths. This information shapes interior design decisions, such as barrier placement, facilities location and waypoint signage.

Copenhagen Airport uses digital information and devices to augment the ability of passengers to navigate the airport with confidence and airport managers to apply detailed real-time information in managing airport operations in new ways.

**CHLA Augments Patient Care and Research With Technology**

In [Chapter 2](#) we discussed Children’s Hospital of Los Angeles to illustrate different sources of value associated with digitalization. Now we’ll focus on the technologies and how CHLA used them to augment hospital staff and processes to raise patient care. The hospital implemented digital technologies with the overall goal of eliminating information errors as a source of patient
harm. With that goal in mind, the hospital brought together a design team of 40 people from varied clinical areas who began working on maximizing technology in healthcare. Their work resulted in a set of technologies that not only reduced information errors, but also augmented the professionals working throughout the hospital. Those technologies started with a focus on integrating information, supporting staff with devices and connecting everything via a medical-grade communications network.

The hospital provides staff with tablets, smartphones and laptops to connect them with digital information throughout the hospital. Medical equipment communicates through the network and provides both patient information and telemetry regarding its own status and location. This improves equipment uptime and utilization — staff knows where the equipment is at all times. Medical staff accesses information via smartphones. This keeps them connected via cellular communications even when they are not at the hospital. While in the hospital, medical professionals use large-format displays to view medical images and tablet devices (in this case, iPads with retina displays) to make the patients’ medical information even more mobile. To aid all of this mobile connectivity, CHLA developed a special bandolier/sling-style case for its tablet devices so that the staff can quickly swing them onto their backs to keep both hands free for procedures.

CHLA created a “medical grade” network to incorporate any medical device that provides patient telemetry, monitoring or imaging. The network is part of a new technical platform that is integrated, event-driven and patient-centered. Based on unified communications, the platform integrates Wi-Fi and carrier-based cellular voice, data and device telemetry according to access priorities. Medical information and other critical data have the highest priority across the network and routing via the most reliable network available at the time.

Building a medical-grade network required establishing a certification program for systems, devices and quality-of-service requirements. This “information density” enables the hospital to deliver service in real time — consistent with CHLA’s conviction that competitive patient care involves teams working in real time with real-time analytics.

CHLA’s implementation of digital technology augments hospital and staff performance. The benefits of its integrated platform and connectivity transform clerical work. It has increased the time medical staff spends with patients by more than 66,000 hours in the first year by simplifying workflows and processes. Clinical areas were not asked to reduce staff because of digitalization, and the hours freed up by digitalization were refocused on patient care and outcomes. The redeployment of human resources, rather than making them redundant, is a hallmark of a digital solution based on augmenting human performance.

Augmenting People With Digital Technology Expands Their Capability and Enterprise Possibilities

Integrating digital technologies into physical workflows and activities augments human performance by increasing information, integration, knowledge and coordination. Amplifying human performance through this type of digital edge creates opportunities because customers and employees play important roles in every aspect of operations and value realization.

Augmentation focuses on raising human performance through new combinations of digital information delivered over devices and supported by advanced communications. Those aspects exist in other combinations to enable different types of digital edge. For example, in the Apply
model, digital information, devices and communication replace resources. In the Accompany model, these same resources raise the operational integrity of existing processes and activities.

Digital augmentation represents the most personal form of digitalization, particularly as advanced medical devices are increasingly incorporated into our bodies. Augmentation is one of the most familiar forms of digitalization, as we encounter it with every access of a smartphone or when we consult a GPS in an automobile. Its personal and familiar characteristics make it a promising area for creating new sources of a digital edge.
10: Abstracting Information, Behavior and Value

We experience the results of digital abstraction whenever search engines and websites tailor their content to customers’ past preferences. At one level the tailoring can be humorous — for example, purchasing a copy of Neil Stephenson’s book, *Snowcrash*, to give to a friend and suddenly receiving a recommendation from the website of every other book by that author, even those it should know you already own!

At a deeper level, the reality is clear: digital technologies enable organizations to know more about customers and their own operations. As a result, they can build an increasingly complex and sophisticated situational understanding of behavior, preferences, conditions and intelligence. A range of technologies supports the Abstract model, including business intelligence, big data and predictive analytics.

Incorporating digital resources into any business generates information that represents a source of insight and value. A digital edge based on abstracting information relies on sets of techniques and technologies that incorporate statistics, advanced mathematics and artificial intelligence with data management to determine the probability of a future outcome that may drive a business decision. Digital technologies support generating value by abstracting and applying information from other digital and physical resources. Figure 10.1 describes this form of ‘digital on digital’ edge.

*Figure 10.1 The Abstract Model of a Digital Edge*

Digital marketing, recommendation engines and advertising represent common applications of an abstraction edge. Google and Facebook generate the vast majority of their revenue from digital abstraction in the form of advertising; targeted marketing, brokering consumer information and measurement services.

This edge consists of a combination of digital technologies such as big data, data mining, predictive analytics, visualization and advanced algorithms. These technologies combine to draw meaning and make sense of large datasets beyond exploiting the statistical correlations and
regression analysis driving most recommendation engines. Advances in digital data processes that enable levels of abstraction and advanced mathematics were previously not economically feasible. Rather than focus on well-documented examples of abstraction such as Google’s ad words or Facebook’s social graph, consider how Royal Caribbean uses digital abstraction to complete its customer experience.

**Royal Caribbean Uses Abstraction to Drive Customer Behavior and Service While Protecting Passenger Privacy**

Each Oasis-class ship generates 25 gigabytes of new data from operations and 80,000 point-of-sale transactions per week from the digital resources passengers and staff use on board the ship. Royal Caribbean sends much of this real-time data onshore, where a dedicated team in its IT organization makes key analytical information available to drive further revenue growth.¹

Various business units use the real-time information to develop customized offers such as spa treatments, show tickets, etc., based on customer preference and cruise ship capacity. Matching passenger preferences with cruise ship capacity is critical, as it makes no sense to send a tailored offer if passengers cannot easily act on that offer. Customized offerings appear on a guest’s interactive room TV during the cruise.

**Privacy Is Not an Abstract Concept**

Privacy is critical to the passenger experience on any cruise, but even more so on one of the scale of an Oasis-class ship. Royal Caribbean’s digital technologies protect passenger privacy through particular combinations of hardware and unique ways of applying information. An earlier example of digitalization onboard Royal Caribbean’s Oasis-class ships highlighted the use of shape-sensing cameras to track restaurant capacity by counting the number of bodies in the restaurant rather than using another technology like facial recognition.

Think about that for a moment. Which gives the passenger more privacy — knowing how close a restaurant is to full capacity or seeing exactly who is in the restaurant sitting with whom?

Another chokepoint in the customer experience is when passengers question charges on their bills. Frequently, they don’t recall the location and time of a transaction. But rather than showing the passenger a picture of where, when and with whom a passenger drank his fifth martini, the company chose to capture an image of every signed passenger receipt and post them to the passenger’s online portfolio, available via interactive TV in their cabin. Sharing this information in graphical form reduces passenger questions and accelerates check-out processing without compromising passenger privacy or creating the feeling of a “big brother” on the world’s largest cruise ships.

The company also extends passenger privacy to the viewing of professional photos taken on the cruise. In this case, facial recognition software tags the people in each photo, allowing passengers to view only their photos by using onboard interactive photo towers or the interactive TV in their cabins.

**Abstraction Rounds Out Royal Caribbean’s Digital Edges**

Royal Caribbean’s use of digital technology appears in multiple places in this book for several reasons. Its digital solutions provide insightful and innovative applications of digital technologies to achieve a specific outcome. The passenger’s experience on a cruise ship provides a personal
reference point. Although not everyone has been on a cruise, most can relate to standing in lines at hotels or airports, giving them an appreciation of the value of eliminating lines. Meeting that outcome involved implementing different digital solutions: digital signage, shape-sensing cameras, kiosks and more that together create a distinctive customer experience. Abstracting passenger data, behavior and choices completes Royal Caribbean’s use of technology. In the process, the company has created a portfolio of the five different models for a digital edge, including:

- Automating operational processes, such as preregistering for onboard shows, events and attractions.
- Applying digital signage and onboard personal communications via mobile phones to keep passengers informed.
- Accompanying digital tablets that equip staff to support the entire customer experience.
- Augmenting customs and immigration formalities for onshore excursions via passenger ID cards and human verification against a digital image taken when initially boarding the ship.

Each of these digital solutions interacts and builds upon each other to transform a passenger’s experience onboard the world’s largest cruise ship. Abstracting opportunities for tailored offerings and better understanding customer behavior completes this portfolio.

United Stationers’ experience offers another example of abstraction in a B2B setting, as its marketing services also complete a digital loop between the company, its suppliers and customers.

**United Stationers’ Marketing Services Abstract Information for Upstream Value**

Information in the form of product descriptions is foundational to United Stationers’ digital business. Product information differentiates United Stationers’ Web search capability, marketing and buying experience in combination with its supply chain operations. Integrating product and purchasing information with Web search gives United Stationers rich product management capabilities that are of value to manufacturers and customers. Manufacturers get value from the ability to see both aggregate point-of-sale and product search information for their products. United Stationers’ reseller customers benefit because this information feeds back and drives the digitalized marketing services that are part of its “white-label” services. The more information the resellers share about their customers, the more valuable these services become for all parties.²

These results follow United Stationers’ discovery that it needed digital technologies beyond those available in the commercial market. In 2010, United Stationers acquired MBS Dev, a software development company, and made it the centerpiece of its technology services business. Incorporating a software company into the heart of an 80-year-old brick-and-mortar distributor illustrates the strategic potential of digital technology.

**Abstracting Information With Digital Technology Closes Digital Loops to Capture Value and Revenue**

Abstracting value injects information, insight and behavior into the digital edge to create a cycle in which the value of abstracted information grows concomitant with digital capability and usage. Abstraction creates digital-on-digital resources that support new information business models and revenue by connecting information with customer experience.
Digital abstraction technologies such as business intelligence (BI), master data management, data mining, big data and advanced analytics continue to evolve in the face of increasing digital density that is accelerating growing information volumes, value and volatility. Abstractive digital information from digital and physical resources represents a capstone that describes the potential value of how to use the information generated by digitalization to create new insights and sources of value.
SECTION III

Becoming a Digital Organization
11: An Approach for Building Digital Capabilities

Following old rules rarely leads to new results. As discussed in Section I, building a digital edge involves more than a company giving itself the digital equivalent of a facelift. It is easy for competitors to imitate “Web-lifted” sales channels, products and services. Creating a digital edge involves building digital capabilities differently to give existing operations new abilities and create new capabilities that were previously either infeasible or uneconomical for the company.

The approach outlined in this chapter describes how companies should build up their internal digital capabilities to produce externally relevant outcomes and results. This places the focus on giving the organization, its associates and customers new sets of capabilities rather than additional point solutions associated with individual digital technologies. **Digital capabilities based on new combinations of physical and digital resources give a company a sustainable and expanding digital edge.**

Figure 11.1 outlines an approach to develop these capabilities by starting from the outside in to describe valued outcomes, and finishing from the inside out to build the capabilities required to realize that outcome.

**Figure 11.1. The Digital Capabilities Approach**

At first look, this figure may be confusing. Where does the process start, where does it end, and what is the difference between the inward arrows and the outward?

**The approach starts from the outside in.** The approach starts at the top and moves around the outer ring to first define the outcome and then describe the capacity, context and interaction required to help your company realize that outcome. Together the outer-right portion of the circle describes the tangible differences digital capabilities provide to create value. This is why the arrows point from the outer circle into the digital capability.
The approach builds digital capabilities from the inside out. The inner circle represents the digital capabilities that should emerge as a company builds them from the inside out. The four arrows radiating outward from the center represent the four aspects of the new digital capability: the enhanced abilities of customers and the company, greater situation relevance, delivery channels and behaviors that shape the experience.

It is a continuous process. It starts outside in and finishes inside out, repeating itself for each outcome required to form a digital edge. These outcomes tend to build on each other to create an emerging and expanding set of digital capabilities and a growing digital edge. That is why the Digital Capabilities Approach shows the two processes as two interacting circles—digital capabilities create facilities for tackling other outcomes. This was the situation that emerged from CHLA's experience building a digital hospital. The digital capabilities associated with the electronic medical record opened opportunities to further enhance patient outcomes, such as capturing shift change notes on video. This also led to CHLA's creation of entirely new digital capabilities, including a world-class information base, to win additional grants and attract leading medical researchers.

Listen and Design Outcomes From the Outside In

“No one asked for the iPod.” This quote, attributed to Steve Jobs, illustrates the limitations of market research and focus groups to create new technology-based solutions in general, and digital capabilities in particular. It points out a fundamental contradiction in creating innovative solutions based on new technologies. How can customers say that they want it when they have no idea what it is?

Digital leaders work based on outcomes rather than customer needs or wants. This is how outcome decisions reached in a digital strategy become digital capabilities. Royal Caribbean’s “no lines” goal was an outcome. Likewise, CHLA's strategy of eliminating information as a source of patient harm represented its design outcome. A good outcome defines the future state of the company, its customers, operations or experience. HFA's outcome of accurate, efficient and responsive digital rights management was an internal facing outcome. The outcome shapes the characteristics of the digital capability as defined by the capacities, context and interactions shown in Figure 11.2.
Start With the Outcome and Work Into the Details

It is important to specify a tangible outcome that defines a clear goal and objective that will drive the design of a digital edge. Making the outcome tangible makes it measurable and gives digital solutions a solid business case foundation. The best outcomes are clear and broad, and concentrate on the external world rather than an internal system. An outcome such as making better decisions with big data is broad, but it is not clear enough to be the basis of a digital edge. Knowing the right decision must be connected to the right execution. A better outcome would be “improving customer profitability by providing more effective offerings.”

Avoid defining outcomes based on technology features or functions. Just because it is possible to do it digitally does not mean it is profitable. A features-and-function focus leads to building digital capabilities that few people will understand and even fewer will use. Hearing the phrase, “We will create an app that …,” is a hint that the team may wander down the feature/function path. It is inevitable that features-and-function statements describing how things work make their way into an outcome discussion. But outcomes that start as features and functions too often end as complex capabilities that have to be explained to customers and associates. Instead, push past feature/function by concentrating on what will be tangibly different and why that difference is desirable.

An example of customer behavior driving a tangible outcome is when CDW’s customers wanted easier access to products in their orders, particularly orders shipped in multiple boxes. They wanted to know exactly where each product was in the shipment. They often called to ask how items were packed in the shipment if they needed some items right away or needed to distribute the shipment to different groups in their company. CDW already provided detailed packing lists, but it went a digital step beyond by introducing a digital camera into the supply chain, taking an image of the box as it was packed and before it was sealed. It then sent that
image to the customers via email so they knew exactly what was in each box before the shipment even arrived. The outcome, therefore, was to give customers as complete a view of their shipments as possible. This outcome led to a simple, innovative and valuable solution; and a new combination of digital and analog resources.¹

Clear and broad outcomes set the stage for innovative new ideas by driving the rest of the design process. An outcome can be broad and involve different situations that form sub-outcomes, (for example, no lines while going to dinner or onshore excursions, and no harm during patient registration or nursing shift changes). Each situation represents an opportunity to apply digital technology. Design teams use these situations to look, listen and learn by working from the outcome outside of the company back inward to describe the other aspects of a digital capability.

The Three Steps to Design an Outcome

Going on a cruise is an experience most of us can imagine, and it provides a way to illustrate the three aspects of an outside-in design: Capacity, context and interactions. Royal Caribbean’s chief outcome was to eliminate passenger queues for all of its cruise-related experiences. The team at Royal Caribbean identified onshore excursions as a chokepoint where passengers could encounter a line. An onshore excursion involves passengers leaving the ship for the day, often in a different country, and then returning at night before the ship sails to a different destination. These onshore excursions require the cruise line to know and report who has left the ship to local authorities, as well as to ensure that passengers are back on board before the ship departs. Failure to do either process well can result in fines; shuttling passengers back to the ship or a broken customer experience. Royal Caribbean applied digital technology to transform this expensive and congestive process. Addressing each customer chokepoint met the goal of eliminating lines on the Oasis-class ship.

Capacity

Company and customer capacity describes the environment required to realize the outcome. Capacity concentrates on looking at the ability of customers, associates, their equipment, company facilities, information, systems and more to produce the outcome. The resulting description defines the ability of the current environment to create the outcome and the changes or additions required to fill any gaps.

The capacities involved in an onshore excursion include the passengers, their identifying information, the number of exits on the ship, the equipment at each exit and the staffing of each exit.

Context

Context describes the outcome in terms of the situational characteristics and requirements. This includes describing the time, place, prior conditions, and emotional and other situational conditions associated with the outcome. Being as specific as possible defines the most meaningful context, at it refers to the information available at the particular place, time and situation. Avoid general context descriptions such as “everything we know” — these are not helpful to the development process.

The context for an onshore excursion includes passenger name, passport, description, relationships between passengers (such as parents and children), destination, cruise line
packages they are taking, time of embarkation, the requirements for the port of call and sailing time.

**Interactions**

Interactions complete the outside-in design by describing the communications, signals, movement and interfaces involved in initiating, experiencing and completing an outcome. Interactions describe how the capacities work with the context to realize the outcome. An interaction includes the required evidence of the outcome that forms the basis for customers to see its value, and the company’s ability to earn revenue from the outcome. Interactions reflect common sense and should be natural for customers and associates.

The simpler the interaction, the better it is for all parties involved. In the case of onshore excursions, the simplest interaction is to have passengers swipe their smart cards and be recognized by the quartermaster as they walk off and on the ship. This seems simple enough, but how Royal Caribbean makes it all work for the passengers is the focus of working to build digital capability from the inside out.

**Building Digital Capability Inside Out**

Starting from the outside in describes the shape of a digital edge in terms of the desired outcome. Finishing that edge requires connecting the outcome with new combinations of physical and digital resources — new digital capabilities — to deliver that outcome in a way that makes value accessible and revenue addressable. The Digital Capabilities Approach emphasizes how to build digital capability — a function that should come before the detailed design and building of technologies. *The difference is in how capacity, context and interaction are connected with the available resources to realize the outcome, value and revenue.*

Building digital capability involves building operational capabilities, with enhanced abilities based on greater situational awareness, that support new behaviors and customer experiences. These factors — abilities, relevance and experience — establish the detailed design requirements for building digital capabilities. Each factor answers the question of how the resources inside the company work to realize results outside its boundaries.
Building Inside Out

Digital capabilities realize an outcome when they create new combinations of digital and physical resources to address gaps in company capacities. Consider the new abilities required to eliminate lines normally associated with onshore excursions. How could Royal Caribbean enable passengers to walk off and back on the ship without standing in any lines? The company needed the ability to identify passengers when they walked off the ship, share that information with local authorities, identify passengers when they returned and know that all of the passengers had returned before sailing to the next destination. Each of these “chokepoints” required enhancing operations to alleviate the onshore excursion bottleneck.

Enhancing Abilities

Technology provides different ways of enhancing these abilities. Royal Caribbean could have used technology to further automate the onshore process and replace physical signatures on paper with staff carrying clipboards to capture digital signatures on tablet devices. That solution applies digital technology but retains the need for passengers to line up to sign out and sign back in to board the ship.

Alternatively, the company could have installed kiosks similar to those used at its port in Florida to manage the process, leveraging a solution that already works, but doesn’t eliminate the bottleneck. Instead, the answer involved moving beyond thinking about how digital technology
can make things faster or cheaper to how it creates new ways of doing things. In this case it involved using a combination of passenger smart cards and informed staff to make onshore excursions as easy as walking into or out of an office building.

**Situational Relevance**

Building situational relevance connects environmental capacity with the informational context at the time and place of the process. Applying situational awareness to products, processes, activities and the environment not only makes things "smart" but it also expands the ways in which information accompanies and augments the physical experience. Start by thinking about what you know about the situation and how that knowledge changes the work required to realize the outcome.

For Royal Caribbean, the question came down to “What do the cruise ship and its passengers know during the onshore excursion process?” The passengers know who they are, who is traveling with them, what they want to do and where they want to go. The cruise line knows much of this information as well. The ship has a photograph of each passenger, it gave each of them a “smart” identity card and it knows which passengers have signed up for its sponsored excursions. Much of this information is precisely what the ship needs to share with port authorities. How it can connect that information with the environment to give the company and customers new abilities is the focus of the delivery channel.

**Digital Platform**

A digital platform describes the interactions and context in which operational requirements result in enhanced ability based on situational awareness. Design of the digital platform describes the actions required to realize the outcome and how the combinations of analog and digital resources work.

Royal Caribbean’s digital platform consisted of smart card readers and informed staff positioned in the boarding area. Passengers swipe their smart card, which brings up their digital image that was taken when originally boarding the ship. A quartermaster compares that image with the person swiping the card providing two forms of validation.

Passengers walk off and back onto the ship without standing in line. Their identities are validated in two forms and the information is shared with local authorities.

But what if there is a problem? The digital capability includes equipping staff with tablets when it is necessary to personally engage a passenger or an unknown person attempting to board the ship. For example, a family disembarks with one parent holding the children’s’ passenger cards. Later, the other parent returns to the ship with the children but without their cards. The parent remaining on shore has the cards. The ship’s staff can approach the onboarding family and be fully aware of who they are and the situation that needs to be addressed.

Digital platforms build on each other to extend and enhance digital capabilities. In the case above, the digital facial image captured at the beginning of the cruise provides one proof of identity that is used by the staff.
Behavior and Experience

Behavior and experience complete the design and development of the digital capability by incorporating the human element into digital capability. Behavior and experience influences shape the ability of people to engage and participate — mentally making choices and taking actions that realize the outcome based on how they interact with the physical environment. Digital capabilities that allow for behavior and experience apply context in ways that make each situation unique to each customer by giving them options that support how they best want to realize the value inherent in the outcome.

Digital solutions can be complex and leave people feeling out of control or less capable. Incorporating behavior and experience considerations into digital capabilities focuses on the value associated with how people see themselves individually or in the eyes of others. Both of these are major sources of satisfaction and value.

The onshore excursion experience should be one associated with fun and adventure while maintaining a sense of security. In this case, the value of the experience is in what does not happen. Passengers remain free to enjoy onshore attractions without the stress of going through boarding formalities and they maintain confidence in the ship’s security.

Building digital capability from the inside out requires investing in specific digital solutions that result in new connections between physical and digital assets. These connections create digital capabilities that enable the desired outcome and experience. Connecting the four aspects of inside-out capability is an iterative process. Teams must work through different combinations of information, behavior, facilities and digital technologies to find the best approach to realize the outcome through new digital capabilities.

A Circular Process Allows Digital Edges to Emerge, Evolve and Expand

Building digital capabilities using a cycle that moves outside in and inside out opens the door for digital capabilities to continuously improve, innovate, evolve and expand as a company builds on existing capabilities and supports new outcomes. Using this approach, the Royal Caribbean team working on the capabilities related to onshore excursions recognized the potential of using digital photos taken during the initial boarding to provide a form of identity to expedite reboarding the ship during onshore excursions. Exploiting opportunities like these is an important aspect of a digital edge and part of a company’s value proposition for investing in digital technologies.

Teams employ a creative and interactive process to create a digital edge by moving back and forth between understanding the requirements for digital capabilities outside in and then building those capabilities inside out. The challenge with any creative process is knowing when to stop. The simple answer is to stop when there is sufficient digital capability to achieve the overall outcome. In other words, stop when the cruise ship has the digital capabilities to eliminate the process bottlenecks causing lines. Stop when the hospital addresses the information-based sources of patient harm. Stop when supply chain and digital services enable resellers to win by forming virtual vertical businesses.

In a sense the process never stops, just as the need for innovation and improvement never stops. Use the following checklist to know when to release digital capability and when those capabilities require additional work.
**Customer** — We have a clear and common understanding of who the potential customers are because we can:

- Describe who they are
- Describe their characteristics
- Recognize them in our current business
- Help them to recognize themselves and their needs

**Value** — We understand the personal and/or business issues facing the customer:

- Define the issue in clear terms that support understanding the situation, frequency, cost and missed opportunities for the customer and our company
- Describe how customers recognize that they have this need, whether they can assess its cost to themselves and the potential value of addressing the issue
- Describe how we will quantify the value in the eyes of the customer, our revenue and operations

**Delivery Channel** — We understand the environment(s) where digitalization is involved in addressing the business issues:

- Where the customer will realize the value (location, setting, situation, etc.)
- The requirements for value realization (infrastructure, prerequisites, preconditions)
- How the customer will trigger or activate value delivery
- How the realization of this value will influence, impact or change other value delivery channels

**Resources** — We understand resources required to design, implement, operate and evolve the digitalized capability:

- The personnel, equipment and facilities involved in fielding and delivering the business outcome (new resources required, changes in resource configurations)
- The changes to organization, jobs, roles, skills, compensation and performance measurement
- The information, systems, infrastructure and other technologies required to field and deliver the business outcome

**Implementation Issues and Risks** — We understand the business, brand and product issues associated with adding this business outcome to our value proposition(s):

- The impact of the business outcome on positioning of existing product offerings and customer promises
- Potential for conflicts with existing channels, partners and other relationships
- Changes in terms of customer expectations for similar experiences in analogous situations
- Potential conflict with regulatory, legal, or other policy constraints

These checklists provide a way to assess when an organization is ready to introduce new digital capabilities into its operations and make them available to customers.
Fundamentally that decision rests with a simple answer to a simple question, “Will the capability achieve the outcome?” A positive response is a sign of a high-potential digital capability.

**Building Digital Capability, Not Just Digital Technology**

Any organization can implement digital technology. In fact, many are investing in individual digital technologies, including mobility solutions, smartphones, big data analytics, digital marketing and social media. A 2012 McKinsey Global Survey of more than 1,400 senior executives found that more than half of the respondents were investing in at least two of these technologies.² However, the experience of the digital leaders featured in this book point to the need to invest in digital capabilities based on a clear understanding of the outcome rather than a focus on digital function or feature.

Starting with an understanding of the outcome gives digital teams a clear, testable and value-based definition of success. That definition creates the context for innovation and new ideas that are the foundation of digital technologies that create a digital edge.
12: Diverse Teams Create Powerful Digital Solutions

Building solutions requires building from what’s currently possible in the organization to create new digital capabilities. This chapter concentrates on the type of teams involved in building the digital edge and the importance of having an effective IT organization as part of the process. Building digital capabilities requires making decisions about the best way to combine physical and digital resources to achieve business outcomes. Those decisions affect the company as a whole, crossing functional, operational and technical boundaries. To build a digital edge, convene a diverse, cross-functional team that reflects the reality of the digital decisions. That team includes IT, which plays a critical role in contributing to a successful digital solution.

Diverse Teams Create Differences That Matter

The diversity of the team influences the strength of the digital solution. A principle for organizing a digital solution team is: The broader the outside-in customer outcome, the broader the team building the solution inside out.

We cannot overstate the importance of the team’s breadth of skills and their understanding of the unique approach needed to build digitized capabilities. A common success factor across the companies described in this book was their ability to assemble and evolve cross-functional teams through the design and build stages.

A digital leadership team, chaired by the executive most directly tasked with realizing customer value and company revenue, is the team responsible for making decisions on issues that run across functional lines or require one function to adjust their processes to better accommodate the overall digital outcome. This type of team was essential for CHLA when it defined a prioritization protocol for information flowing across its network — the highest-priority information getting the highest-priority resources. Representation from every department ensured that such a complex technical, political and process-oriented decision would involve all major constituents.

Building consensus on what the highest-priority information should be might be a contentious matter. However, the defined customer outcome and experience should provide the yardstick for defining the “best” decision. Without the customer outcome, decisions can readily devolve into functional interests and politics.

CHLA formed a digital leadership team with decision makers from all of the clinical areas and charged the team with resolving cross-clinical issues in the interest of the goal of eliminating information-based causes of patient harm. The result was a priority on patient test results. Now, even massive data files such as CT scans receive network priority so that no one needs question when a test result is in. In other words, if everyone knows that test results are top priority for network traffic, then no one questions whether the data file might have been too large to transfer to the patient record. It’s a requirement of a successful solution and a priority.

Other companies studied for this project employed similar types of teams. At Royal Caribbean, the leadership team consisted of the senior vice presidents of hotel operations, customer service and the CIO. At CDW, the CIO in his role as “chief productivity officer” holds the digital leadership role, reflecting the alignment between information, applications, processes, customer service and supply chain solutions.
Traditional forms of IT steering or oversight committees lack the capacity or context to resolve contentious issues in a timely manner. Making these decisions requires active, rather than passive, executive presentation. The decisions are simply too frequent, complex and fast-paced to handle in a traditional manner. For this reason, each leadership team member should have the authority to make binding decisions for the area they represent.

Diversity Is Key

Expert teams from different disciplines should form the core of the design and development teams. Team diversity is a critical success factor. The temptation to staff expert digital teams with digital experts will be great. After all, people may wonder how those with a vested interest in today can create solutions required for a disruptive future. This is a valid point, but the digital teams in the companies we studied exhibited an important trait: **We found a relationship between the power of the digital solution and the people required to build it.**

Narrow teams work best when building narrow, predefined or prescriptive business solutions. A narrow team consists of people with similar backgrounds, responsibilities or interests. These teams are good at building concentrated digital point solutions, like connecting parking meters or placing remote sensors that address specific business issues via digital technology enablement. They tend to build and optimize what they know and are therefore less suited to building solutions that change a customer experience. A narrow team is less likely to recognize the value of customers knowing how the products are packed — via the digital image CDW provides — than optimizing the packing list. A team that concentrates on how the technology works — its functionality — more than the customer experience may be too narrow to create a digital edge.

Broad teams build broader business solutions that reflect the connections required to deliver a different customer experience. The truth is, customers experience a company, its products and services in their totality, not as a collection of functional specializations. A broad team consists of people from across different aspects of the enterprise. At Royal Caribbean, team members came from hotel operations, event operations, ship engineering, IT and other functions. At United Stationers, digital solutions required the contribution of product marketing, supply chain, supplier relationships, and more.

A broad team provides the breadth of knowledge and the depth of experience required to create a different digital experience that leverages existing resources, assets and capabilities to give digital solutions scale capacity and speed of implementation. Jon Stevens of CDW characterized the power of these teams in the context of digitalization. “Digitization forces us to go back to basics. Before applying information and technology, you need to know how things will work and how to keep them simple. Getting back to basics is critical in keeping operations lean, focused and simple.” This requires teams with a healthy amount of “legacy” experience to identify and make the connections between customer intent, information or facilities and current operations to deliver a different customer experience.

IT personnel figure prominently in these teams because of their expertise in communications, networking analytics and the customer experience. Companies should not, however, limit this role to technical experts. The business outcomes frequently require new combinations of jobs, roles, equipment, facilities and other elements that all have to work within the context of established processes, facilities and other resources.
A Diverse and Engaged Team Finds Opportunities in Emerging Digital Solutions

No one knew what a light bulb looked like before it was invented and no one set out to invent the Post-It™ note. These solutions emerged either from experimentation, deep understanding, an accident or a combination of all three. Likewise, it’s rare that anyone can predefine the design of their digital edge, or describe exactly how it will work before they have built, deployed and improved it.

Building a digital edge requires allowing digital capabilities to emerge and evolve as the teams diagnose, design and build the solutions required to achieve the customer outcome — captured by listening from the outside in. United Stationers started creating its digital capabilities based on sharing product information and descriptions with its reseller customers. Customers recognized the value of that information and the potential to band together and engage United Stationers to back them in competing for larger contracts. This created new digital solutions that emerged in addition to what was intended when United Stationers first began sharing the product information.

Similarly, Royal Caribbean’s digital capabilities started from looking at how technology could reduce chokepoints. Each chokepoint started as its own solution, such as using kiosks to capture facial information at check-in to facilitate boarding the ship. These individual solutions wove a digital fabric that allowed new digital solutions to emerge; for example, using the facial recognition information to route shipboard digital photos to passengers’ rooms rather than posting them on public bulletin boards.

Adopting an emergent approach creates the free space in which cross-functional teams can discover how the company will realize revenue and value from the emerging customer outcome. It also allows teams to recognize new solutions as the density of information and digital solutions increases. At CHLA, nurses initially left patient notes as typed text in a patient file for the nurse coming on duty at shift change. Eventually, the staff suggested that it might be more efficient and effective for the staff to use the video capabilities of their tablet devices to record a video memo of patient notes. That suggestion is only possible because it builds on the existing set of digitally dense solutions.

Organizations often resist emergent approaches to building solutions because they can be messy and difficult to control, and can easily lead to runaway projects. Planning on a solution to emerge can feel like pulling on a loose thread that will unravel the fabric of your organization and its systems. But an emergent approach is often necessary to create solutions that are responsible for creating new customer experiences and behaviors facilitated through digital technology that cannot be prescriptively defined. To avoid the potential mess, keep a constant and direct connection between the customer experience outcomes, defined while working outside in, with the digital solutions they are building inside out.

Designs for digitized capabilities emerge from connecting these perspectives. IONX, for example, would have limited its digital capability to developing tracking and sensory hardware. But the company knew that the real-time information needed for its digitized remote tracking devices was just as important. IONX’s analytics software, the links to commercial ERP systems and a cloud-based offering were also integral to delivering the outcome.

Discovery and design processes, though ongoing, are not always at the same intensity, since the enterprise learns and adapts to its digitized capabilities as it identifies new outcomes and
experiences while working with customers. Appendix 2 contains a checklist to help assess the completeness of digital solutions and their fit with the customer experience and company value proposition.

Build Common Digital Platforms, Not Competing Digital Application Portfolios

The old adage in technology is to start small and scale fast. The question is to scale what? The traditional answer is to scale IT applications, increasing the size, complexity and cost of IT. Digital leaders are taking a different approach, evolving a digital platform rather than creating a portfolio of digital applications. The difference seems subtle but its implications can be powerful, particularly when creating a digital enterprise or digital customer experience.

It is possible to build and deploy individual digital point solutions to address specific needs. Find a problem; build an app, problem solved. These solutions get significant media attention, such as allowing people to pay for parking via a mobile phone or replacing paper airline pilot manuals with tablet devices. But while they create different digital solutions, they are only part of building a digital edge.

United Stationers could have taken this approach, building unique solutions to support specific virtual vertical businesses. However, the company recognized that the value of its digital resources rested in the information, not the applications. This led to the creation of its white-label services, offered via the cloud, and customized interfaces for those services at the point of the customer experience.

Organizations understand and are comfortable with a portfolio approach — it fits traditional IT patterns and lets business units and functions go it on their own. Creating a portfolio of digital applications creates a new issue as each group seeks their own point solution to their own problems — too many apps.

A digital platform is an information-intensive collection of commonly available resources, not a portfolio of application-intensive solutions. A digital platform is the collective environment supporting the customer experience. It is the one place that supports multiple solutions. Physically, a digital platform is more of an idea and concept than a “thing.” It represents a collection of digital resources, a common repository from which the organization can draw upon information, communications, interfaces, processes, facilities and equipment in delivering the customer experience. Figure 12.1 provides a generic illustration of the different architectures and elements within a digital architecture. A detailed description of each level is contained in the Appendix.
A digital platform is unique to the organization. At CDW, account managers and the supply chain form the basis of the digital platform. United Stationers’ digital platform consists of product information, the supply chain, cloud services and the supplier network. For IONX, it is the physical sensors, telemetry, the communications network, the logistics modules and its logistics services. CHLA developed its digital platform based on meeting its patient outcome goals that requires clinical areas to work with common information, to coordinate resources and procedures, and to share information. Everything that forms the keystone for its platform is linked to the electronic patient record at CHLA. The patient is the focus of the customer experience, so it is a natural focus of digital capabilities and the requirement that everything connect to it.
This point is critical, as information becomes the basis for the customer experience, not applications, products or services. This gives a platform the ability to support multiple customer experiences from a single set of resources via common information rather than consolidated systems. At CHLA, the patient record and information such as test results, prescriptions, procedures and notes are commonly held and available to all clinical areas without requiring all clinical areas to force-fit their specialized needs into a one-size-fits-none unified solution.

The emerging digital platform accumulates as the organization builds solutions inside out in the context of its outside-in goals. Its ability to field new digital solutions grows with the platform because placing more things in common enables the company to assemble new solutions by building on what is in the platform rather than adding to a portfolio of individual applications. Royal Caribbean experienced this, discovering that the capabilities created as a solution to one bottleneck could be used to address other issues.

**IT’s Role in Building Digital Solutions**

The role of IT in business digitization has been a subject of debate. Some see digitalizing revenue and working with new channels as a business or marketing responsibility, with IT in a supporting role. That view is appropriate for organizations with underperforming IT. But for those with an effective IT organization, one that is able to make and keep its commitments, the evidence suggests that IT should play a greater role in creating a digital edge.

A study of more than 2,000 firms in the 2010 Gartner Executive Programs CIO Survey found connections between financial performance, digital effectiveness and IT effectiveness. Firms with effective IT organizations use them as a single responsibility center to generate synergies across the enterprise and produce a consolidated set of enterprisewide digitized resources, as opposed to allowing individual business units to pursue disparate strategies. These top quartile firms are 30% more effective in building digital assets than their peers. Organizations tasking IT to converge digital solutions have a higher percentage of their revenue coming from digital resources. Finally, these organizations outperform all other enterprises across four areas: return on assets, return on equity, revenue growth and cost-of-goods growth.

Use Figure 5.6 to set your digital strategy. An enterprise digital architecture covers the range of structures involved in a digital organization, regardless of their source. In talking about this digital architecture, Hung LeHong, vice president, Gartner Research, pointed out that it is important to recognize that parts of the architecture will not belong to or be controlled by the company. This point goes beyond simple notions of outsourcing or contracting with suppliers. For example, where customers previously carried out self-service activities on company-supplied equipment, they will increasingly perform the same tasks using their own devices or even third-party applications. A digital architecture therefore bleeds out of the enterprise’s four walls and into the consumer’s/citizen’s/employee’s personal architecture, particularly in terms of the structures involved in achieving customer outcomes — the interfaces, devices and channel architectures. Companies do not have to build these architectures, a benefit, but they still need to architect them.
Figure 12.2 Enterprise Performance and Levels of IT Involvement

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Top Quartile</th>
<th>All Other Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of enterprise digitalization spend in the IT budget</td>
<td>86%</td>
<td>20%</td>
</tr>
<tr>
<td>Return on assets for FY 2010</td>
<td>+2.4%</td>
<td>-1.0%</td>
</tr>
<tr>
<td>Return on equity for FY 2010</td>
<td>+12.1%</td>
<td>-5.1%</td>
</tr>
<tr>
<td>Revenue growth for FY 2010</td>
<td>+7.3%</td>
<td>-6.8%</td>
</tr>
<tr>
<td>Cost of goods growth for FY 2010</td>
<td>-7.5%</td>
<td>+6.9%</td>
</tr>
</tbody>
</table>

Source: 2012 MIT Sloan Center for Information Systems Research and Gartner Inc.

Figure 12.2 makes a strong case for IT’s participation in building the digital difference, particularly when the IT organization is already highly effective. CIOs can best support digitalized business results by building effective IT organizations.

Creating a Digital Edge Involves Building Digital Capability Within the Organization

Digital technology touches every aspect of the organization, requiring a coordinated enterprise response, and that shapes who is involved in building new capabilities and how they work. Diversity is key to creating the type of solution that extends across functional and system boundaries. Teams work from the outside in and build from the inside out to evolve the solution while remaining focused on the overall goal based on a shared digital platform. A highly effective IT organization plays an integral role in creating that platform and realizing the business performance of digitalization.
Royal Caribbean, Children’s Hospital of Los Angeles, The Harry Fox Agency, United Stationers and the other organizations we’ve discussed in this book capitalized on digital technologies to change the way they generate revenue and conduct their businesses. They also discovered that creating a digital edge requires a certain amount of disruption to the organization itself as much as it affects its products, services and operations. In order to achieve their various types of digital solutions, these companies relied on and/or made fundamental changes to how they managed and measured achieving the outcomes. Some relied on digital insight at the Board of Directors level, some created a new executive role and others realized new methods of measuring results. Eventually, they all faced opportunities to evolve the organization to implement and sustain a digital edge.

**Digital Technology at the Board of Directors Level**

The Board of Directors for a company can serve as one of the resources for companies formulating their digital edge. In particular, organizations such as FedEx, United Stationers, Proctor and Gamble, and others have established board-level committees focused specifically on technology and innovation.

Many Boards of Directors, while they are interested in technology, tend to focus on technology as an enabler and assign its oversight as a matter of risk, budget and compliance best handled as an aspect of an audit committee. But placing technology issues in the Board’s Audit Committee reflects a view that technology is more of an operational expenditure than a creator of strategic opportunity. This may have been appropriate when the majority of technology issues were IT-related, concentrating on automating and integrating back-office operations. However, digital technologies, with their potential for direct contribution to revenue and competitive edge, should generate a greater board-level focus on the strategic opportunity.

At United Stationers, the board played a critical role in helping steer the company toward its digital edge. According to CIO David Bent, “We have a technology-savvy board of directors. Several of them have direct experience working in e-commerce companies, using technology to disrupt the industry. Their experience and knowledge have been central to the big decisions we have made, like purchasing a software company. They have given us a different view of the company. Rather than seeing United Stationers as a distributor competing against other distributors, the board and executives saw the latent value of our digital resources and capabilities that led to new strategic options.”

To assess the merits of a technology committee at a board level, look at a sample charter for an Innovation and Technology Advisory Board, found in Appendix 3, for its purpose, function, powers and responsibilities. The suggested roles and responsibilities of this standing committee communicate its importance to the enterprise.

This sample charter for an Innovation and Technology Advisory Board outlines the responsibilities and mechanisms for boards to increase their engagement on digital and technology issues. On the surface, many of these responsibilities seem similar to those already assigned to other committees, most notably the audit committee. The difference lies in the skills and focus required on an innovation and technology committee.
Traditionally, technology or IT projects represented significant expenditures and operational risk. A major ERP project, for example, represented both, with reasonable oversight offered by assessing the project’s resource requirements and risk profile. These characteristics fit within audit committee responsibilities for overseeing the company’s resources, investments and risks. Boards have translated technical issues into financial, operational and control frameworks to fit within the profile of audit committee responsibilities and membership associated with IT. The issues related to digital technology are not the same as those for IT. Consider the digital hospital at CHLA, where technology plays a fundamental role in reducing patient harm, or how FedEx created an advanced package sensor network and CDW applied technology to the core of its customer service. These are applications that influence the fundamental performance profile of a company.

Digital technologies require a different type of oversight. Audit committees, using financially based forms of oversight, can handle preplanned IT solutions that enable the business. These IT solutions have defined requirements, predictable operational results and estimated resource requirements that can be more readily translated into financial frames of reference.

Digital solutions, on the other hand, are complex, combinatorial and creative; making it difficult to predefine, assess and mitigate risk. Digital solutions emerge as digital capabilities built on each other, and therefore cannot be readily preplanned. This makes commonly used financial-based oversight techniques less appropriate.

In addition, new strategic options require new forms of Board oversight and executive leadership. While some digital leaders such as FedEx, United Stationers or Proctor and Gamble employ innovation and technology oversight committees at the board level, others have invested in a new executive role — the Chief Digital Officer (CDO).

**The Chief Digital Officer**

Digitalization requires a type of collaboration that spans the organization’s functions in order to create a digital edge based on an integrated customer experience. The idea of a “chief” role responsible for a specific aspect of the enterprise is not new. Organizations have created similar, specialized, and cross-functional roles before. During the late 1990’s a focus on business processes led many to create a Chief Process Officer role. E-commerce and the Internet led many others to create similar roles around those technologies, such as Chief Internet Officer or President of E-Commerce Czar.

A C-level role tells the organization two things. First, the organization needs to change its focus and collaborate in new ways around new responsibilities. Second, creating an executive-level single point of visibility, responsibility and strategy around digital technology tells the organization that you are serious about creating a digital edge.

**Do Not Limit Your Chief Digital Officer to Marketing or Social Media**

There are two major forms of Chief Digital Officer. The first type to emerge grew out of the social media and digital marketing world, with goals such as improving online communications and engagement. This Chief Digital Marketing role is primarily concerned with the enterprise’s brand, image, communications and engagement. This role is important, but the CDO described here is involved in driving the use of digital technology to create and sustain the entire organization, not just its image on social media.
Digital solutions require spanning boundaries, driving to a deeper level of coordination and building integrated capabilities. Meeting these requirements in your organization may require creating a CDO role. It is similar to other C-level roles in the sense that the CDO:

- Provides a single point of coordination, action and executive oversight for digital initiatives
- Works with the other C-level positions to create a digital vision and identify opportunities for digital solutions
- Defines the strategy for how digital technology will be incorporated into the enterprise, customer experience and operations
- Sponsors digital transformation projects and investments, providing a single executive point of contact across the enterprise
- Is responsible for realizing the digital strategy, the success of digital solutions and the generation of revenue
- Drives information, analytics and performance data into the organization and its decisions
- Has ongoing responsibility for evolving and improving digital capabilities based on progress against goals

CDOs are unique because their responsibilities span those normally separated on the executive team. CDOs, like Dave Bent at United Stationers, are responsible for the performance of digital channels and operations from top-line revenue to bottom-line earnings, particularly when their organizations consider digital solutions a separate business unit or channel. Mike McDonnell at IONX has a similar role in the development and deployment of its remote monitoring capability.

Being responsible for everything from revenue to operations to profitability and earnings reflects the complex nature of digital business solutions. CDOs need a combination of skills and experience normally found in other executive roles, such as marketing, operations, information technology, supply chain and financial management. The broad demands can lead the organization to specialize the CDO role, for example, with a heavy marketing or technology background. If that is the case, then the organization should counterbalance that specialization by creating a digital executive committee involving other executive roles to produce a comprehensive set of digital capabilities.

Every organization needs an executive or executives leading and sponsoring the changes required to create a digital difference. In each of the case studies, the organization can name the executives leading in the creating their digital edge. That executive was the CIO at CDW. An executive team consisting of the head of hospitality, head of hotel operations and the CIO led in the digitalization projects at Royal Caribbean. The executive team, represented by leaders of each clinical area, formed the core at CHLA.

How to Fill the Roles and Responsibilities of a CDO

Not every organization needs a formal CDO. The role can be transformational and transitory, similar to the role of Chief Process Officer in the past. Consider creating a formal CDO in situations where:

- The organization works along formal and strict functional lines, with clear and nonoverlapping responsibilities
• The organization sees itself as a collection of individual operations, business units, channels or lines of business
• The organization has fragmented customer experience, products and channels that require greater integration to produce greater results
• The organizational culture requires a specific and identified leader to champion change and integration

If these situations apply, then consider creating a formal CDO. Your organization needs a single focal point to drive transformation. Alternatively, if the leadership team collaborates effectively, willingly makes operational adjustments in their groups to support others, and routinely achieves its shared goals and objectives, then consider the role of CDO as transformational and temporary.

Creating the CDO role gives an organization focus by concentrating responsibility into a single executive position. The role can be a powerful catalyst that brings an organization together to create new digital capabilities. Sustaining those capabilities requires maintaining collaboration and integration over time. That requires the organization to address the measurement and recognition issues created by digitalization.

Measuring and Managing Digital Performance and Contribution

“When something is everyone's responsibility, then it’s no one’s responsibility.” That management adage drives many organizational performance reporting, recognition and contribution systems. Measuring along clear lines of responsibility makes sense, when it is possible to establish those lines. That may not be the case with digitalized solutions, particularly those where customer behavior and choice influence business outcome and result.

Measuring Digital Value Means Measuring Outcomes and Experiences

A digital edge creates new digital capabilities based on extracting and infusing information and technology. Measuring digital performance depends on measuring these new capabilities, their performance and the value that they create. This requires the organization to measure the outcomes of digital capabilities and how they change the customer experience.

Simple measures can only prove simple relationships that shed little light on performance and value. Every organization is complex and dynamic in its strategy, operations and performance. This makes establishing direct and causal connections between an action and result interesting but often organizationally irrelevant. Frequently, when you provide a report that your organizational change resulted in higher revenue, lower costs or better service, a debate quickly forms about other causes of that result. Digital capabilities that incorporate new combinations of information, behavior, experience, product, service or process make the issue even more important.

It’s important to avoid the trap of false precision, debating the causality of action with result, by measuring outcomes. Digital capabilities are supposed to create new results, so measure those results to figure out if the company’s capabilities are creating value. This is done by asking what will be tangibly different when the digital capability is online. Finding evidence of that tangible difference measures the operation of that new capability.

Reducing information-based causes of patient harm is an outcome of digitalization at CHLA. That goal makes measuring straightforward, as digitalization should reduce the number of situations leading to patient harm and the role of information in those situations. Royal Caribbean
Cruises measures the capacity of its restaurants as a way to assess the value of digitalization. If the restaurants are full, but not so full that they create lines, then the digital solution is helping to achieve its customer experience goals. One thing Royal Caribbean cannot know for certain is what percentage of its guests use digital channels in determining where to go for dinner. Investigating that type of causality is possible, but you have to determine if it’s practical or if it would lead to a different way of running the business.

**An Approach to Measuring Digital Value**

- Identify the customer behavior, business outcome or process performance metric that should change with the introduction of digital capabilities. Every action has an intended result or reaction, so name that outcome.

- Define how the organization will recognize achieving the outcome. For example, if increasing the average revenue per account manager is a goal of digitalization, then determine if that increase actually happened.

- Establish the information required to evidence the outcome being reached. Concentrate on observable differences in the business rather than participation rates or other intangible factors that are difficult to measure and may have no meaning.

- Avoid assigning results along organizational or business process lines, as divisionalizing measurement motivates complexity and hand-offs. It also absolves organizations of their end-to-end responsibility, because “my group is doing its job” is not the only definition of success. Establishing a wholly separate stand-alone digital business is a caveat to this guideline.

The nature of digital capabilities, with their value coming from applying information across product, process, customer and corporate boundaries, makes measurement difficult. The integrated nature and reliance on changing behaviors means that digital value cannot be directly ascribed to specific actions or intent. Rather, it is the outcomes of those actions that demonstrate the value of digital capability. Capturing that outcome requires bypassing traditional issues of benefit assignment, responsibilities and compensation, as United Stationers’ experience illustrates.

**United Stationers Sees Measurement as a Good Problem to Have**

United Stationers’ continued digitalizing of its business has involved changing process, technology and other implementation issues, along with business issues such as pricing, compensation, performance and rewards. To date, the extended digitized services have been bundled into United Stationers’ core value proposition, so the contribution of these services to the bottom line is not always clear.2

“Whenever you create something new and bundle it into an existing offer,” explains Dave Bent, “it becomes difficult to value and easy for the sales force to discount or give away. Management systems may consequently discount the contribution of digitized resources, since they are hidden in the overall margin, while the costs are clear and transparent.”

Bent and his team are addressing these issues in three ways:

- By pricing the value-added digitalized services, since they generate stand-alone revenue (e.g., marketing services) and enable creation of markets and product lines
• By implementing performance management of digitalized services from the standpoint of both the operating unit and the individual working in the unit, because the services have a different cost and margin structure

• By reconsidering compensation for sales and delivery personnel working in digitized areas, since the supply chain and digitized resources are shared across the lines of business

Bent notes that these are good issues to have, being symptomatic of a successful business. “No one worries about pricing and compensation in a business that is not achieving its objectives,” he says. “But as digitization creates new revenue and business streams, these issues become even more important.”

Creating a Digital Edge Involves Organizational Evolution

It’s important to realize that creating a digital edge brings together disparate organization units, channels, products and operations. Establishing an innovation and technology advisory committee within the Board matches technology potential with the executive attention to realize results. The responsibility for leading digital transformation rests with the role of a CDO, either as a formal role or as the sponsor of digitalization initiatives that extend beyond leveraging digital channels for marketing and communications. Sustaining transformation requires more than launching a new product, service or channel — it requires establishing new measures that reflect the contribution of digital technologies.
14: Road Map for a Digital Edge

An edge forms where two sides meet. In the case of a digital edge, the combination of digital and physical resources forms a set of tools to create value and revenue. As we’ve discussed, the five models of a digital edge represent a toolbox of these combinations, what they can do, and how others have used them for their success. These models help define what it means to go beyond feeling digital.

Another type of edge represents a frontier, the border where one country gives way to another, where certainty meets opportunity. This edge requires a strategy and a map to navigate a new world, because crossing a frontier changes the rules, competitors and expectations. Similarly, new ways of thinking about value, revenue, capability and the need to start outside-in from an outcome represent behaviors for living in a digital world. This chapter combines the key points of the book with evolving digital developments into a road map for companies to navigate the digital world and create a digital edge.

Looking Beyond the Edge

Digital density, measured by the number of devices, the connections between these devices and the volume of information, is continually increasing. Eric Brynjolfsson and Andrew McAfee point out in their book, Race Against the Machine, that Moore’s Law, or the doubling of technology capacity and ability, is reaching “the back half of the chessboard,” where future doubling opens the door to real possibilities.1 We are starting to see those possibilities in the case examples explored in this book and those we will see in the future.

Creating a digital edge involves taking advantage of technology capacity to create new solutions that bring together physical and digital resources. Digital opportunity grows as digital density increasingly puts everyone at the edge of a new frontier. What lies beyond the digital edge as we currently understand it? How are the forces that create a digital edge moving and changing the shape of commerce, the behavior of customers, the pace of technological change and the sources shaping a digital edge?

Digital Capability Will Continue to Break Down Borders Everywhere

Digital capability collapses traditional borders by flooding them with information, communications and new capacities. A digital capability describes the solutions created by extracting and infusing digital and physical resources. Examples of digital capability include IONX’s use of remote sensors to give rail cars a voice, CHLA’s infusion of information into patient care and Royal Caribbean’s use of information to augment passenger experiences.

Distinctions between industries, customers and innovation break down with digitalization. Distinctions between players in a value chain blur, such as between local resellers and the government in United Stationers’ “winning from the middle” strategy, when manufacturers like IONX become service providers and when divisions across the supply chain fade at CDW. The result is creating new connections and combinations of information — mashups that create value.

Expect more business mashups where integrating disparate information connects previously disparate processes, products and activities. Already, telematics information from automobiles is mashed up with automobile insurance, creating a form of pay-by-the-minute insurance.
Tomorrow, a company moving hazardous materials might update a fire department in real time to ensure safety in case of a fire.

Digitalization Will Accelerate Consumerization

Consumerization is everywhere. Digital capability equips individuals with tools previously reserved for companies. The result is that everyone wants to be a consumer, not a step in a process: B2B (business to business) becomes B2C (business to consumer). In IT, people want to bring their own devices (BYOD); in the workplace, employees seek greater participation and control (consumerization of management); citizens want better levels of government service (consumerization of government); and customers are using social media to take control of company brands (consumerization of the brand).

Digitalization drives consumerization by reducing technology and information costs while at the same time raising information availability and technical capacity. Simply put, digitalization gives people more powerful tools and the expectations to match them. It is not possible to take these tools away from consumers. Companies that try will only find customers creating tools on their own.

As B2B becomes B2C, more attention will be paid to the customer experience within the business process; expect companies to provide higher-touch service through technology, like CDW did, as a competitive differentiator. Also expect industrial products to take on more consumer characteristics, capabilities and marketing, as evidenced by all the ads on TV for pharmaceuticals. What was once strictly a B2B market is now being targeted to consumers.

Value Will Be More Personal

Digital technology opens the door to a broader definition of value, as discussed in prior chapters. Value is evolving beyond product, price and performance to incorporate how customers look and feel about associating themselves with products and services. How do you feel when you demo a new app on your smartphone to a colleague? That is part of the value of owning a smartphone.

Digital technologies enable customers to draw value from their experience in ways that go beyond imprinting or associating with a brand. Sharing experiences and being recognized in a peer community represent new sources of value (look at Craigslist, Amazon reviews and Yelp, for example). Imagine a near future when customer content is embedded in the product itself, marketing is augmented in real time with recommendations, and products share tips, best practices and innovations. How a company’s offer connects with people at a personal level and how it makes them feel to others can make a difference in an increasingly crowded digital world.

Behavior Is Part of the Next Competitive Frontier

Behavior in business is either the subject of investigation (bad behavior) or gentle coercion (marketing and business processes). Before digital technology, behavior was part of customer segmentation or corporate culture. Companies assumed that it was slow or difficult to change.

Digital technologies such as social media, mobile, analytics and transparency make behavior an accessible and addressable source of competitive advantage by combining information,
choice and brain science. This fusion is the subject of excellent books by Dan Ariely and Jonah Lehrer among others.

Behavior means nothing without choice, and people favor choice. Companies must give it to them. Digital technologies like social media, digital signage and analytics create an environment defined by choice. Rather than fighting it, choice should become a central part of a company’s value proposition. Choice reinforces the buying decision and desired behavior, as customers actively associate themselves with products and services rather than passively accept an offer. When choice is artificially restricted it becomes coercion, eroding commitment and loyalty simply because companies do not recognize and reward it.

Behavior is part of the next competitive frontier not only because technology provides new tools to influence behavior, but also because behavior is a source of difference and advantage. How you feel, what you choose and what you tell others is individual, unique and not easy to duplicate.

Forge Ahead — Build a Digital Strategy and Digital Edge

The time to create a new digital strategy is before competition sets the strategy for the industry. Ten years ago, organizations slow to adopt the Internet found themselves forced to move online and follow the patterns set by others. That is one reason why company websites, e-stores and online support for the most part look the same. That cycle is starting to repeat itself in the digital world, particularly when it comes to mobile applications and social media.

Following digital leaders like Google, Facebook, Apple, Amazon or LinkedIn, among others, provides few answers. Their revenue models rely on digital scale, advertising and freemium-based offerings to make money in a digital world. Most firms do not have the digital scale to attract advertising revenue or the product margins to support giving away products and services.

A New Type of Strategy

Many things are possible with digital technology, but only a few are profitable. The temptation to pursue technology-led strategies, such as a mobile strategy or an online strategy, is real, but it’s not a real business strategy. Recognizing the difference requires taking a fresh look at the value of customer outcomes and their ability to turn into revenue.

It’s counterintuitive to recommend a strategy based on simple statements of outcomes and goals, but that is the essence of building a digital edge. Rather than creating a grand digital strategy filled with platitudes and broad statements, start with critical customer outcomes and goals. These outcomes set the domain of action and scope for strategy execution. They make digital execution manageable and accelerate time to market.

Anchor digital strategies in simple outcome-based statements, like eliminating lines, reducing information-based sources of patient harm or delivering high-touch customer service. These statements set the strategy on a path to achieve results rather than remaining stuck in appropriating resources and responsibilities. Outcome statements provide the basis for creating the combinations that forge a digital edge. They provide a focus that starts from the outside in and builds from the inside out.
A New Type of Organization

Getting an edge and getting ahead of the competition involves adopting new ways for managing and working that reflect the realities of digital technology. Digital technology relies on connections and combinations. In isolation, technologies like mobile phones, tablets, big data and social media mean little. Imagine the value of a mobile phone without apps, analytics without operational information or social media in which only a few people participate. The connections between digital technologies support innovative and disruptive solutions. Realizing those solutions involves creating similar connections within the organization.

It is difficult to build a broad, integrated solution with a narrow technical team. The digital leaders highlighted in this book altered their organizations to manage and work in ways that were as connected as the technology. This starts at the top by managing technology as a critical resource with a dedicated board committee rather than treating it as an audit-based expenditure. This connected approach extends to the teams designing, building and operating digital solutions, as exemplified by the cross-clinical team at CHLA or the cross-operational team at Royal Caribbean Cruises. By assembling a broad team, you broaden the scope and increase the team's ability to discover, design and deliver powerful digital capabilities.

A Different Game Plan

The digital edge starts with recognizing current resources and how those resources combine to create new capability. It finishes with building and operating these capabilities as part of an evolving and expanding digital business platform. Here are some suggestions for getting started on building a digital edge:

• **Assess opportunities for digitalizing the business by identifying customer outcomes and current contradictions that exist in the business.** These form the simple outcome statements that are the basis for digital solutions. Pay attention to situations where current operations limit customer value, where applying information releases physical resources, or where encouraging customer behavior changes customer experience and value.

• **Consider the value and revenue implications of each opportunity.** Creating a new capability should address an issue, achieve an opportunity or generate recognizable customer value. Assess how that value turns into revenue, either directly through greater sales or pricing power or indirectly by opening a new market, increasing resource utilization or controlling costs.

• **Inventory the physical and digital resources involved in each of these opportunities.** Where is the opportunity, when does it happen, to whom and in what context, are all questions that generate a resource palette to start the development process.

• **Prepare the organization to collaborate on bringing digital capability to market in terms of the cross-organizational design and development teams.** Pay particular attention to IT performance and capacity — the more effective the IT organization, the more effective the digital solution.

• **Listen and design outcomes from the outside in and build them from the inside out to achieve a balance between risk, scale, speed and cost.** Working in both directions creates a cycle of idea generation, refinement and innovation best able to take advantage of digital technology.
• Accept that digital capabilities will evolve over time as digital solutions build on each other and new digital technologies come online. No one can predict the future set of digital technologies, but we can predict that they will be different from what we work with today. Plan for this evolution by recognizing that it’s a natural part of working with emerging technologies. Avoid deep investments in particular technologies in favor of investing in the one thing that does not change — the information involved in running the business.

• Leave the door open for the future, the unknown experiences that lead to new sources of advantage and new digitally intensive resources. It’s hard to see the future, much less move toward it, with predetermined and prescriptive plans.

The Opportunity Beyond the Edge

Digital technology, at the time of this book, is just beginning to work its way into organizations. Initial waves of mobile applications, social media, big data analytics and enhanced e-commerce solutions form the technology agenda for many organizations. However, today’s agenda items are rarely the basis for tomorrow’s sources of competitive advantage.

In this book, we took a hard and actionable look at how leaders are applying digital technology to do more than create virtual copies of their current business models. The attraction of this form of digital mimicry is strong: It offers a simple, safe and easy-to-implement approach to digitalization. Playing “follow the leader” in the digital world gives an organization market-matching capabilities that may be viable in the short run, but raises vulnerabilities to digital disruption.

Digital technologies represent more than an upgrade or shift in the way we work. They offer more than a “third industrial revolution” that upgrades performance without resolving persistent issues and challenges. Many of the fundamental challenges of the industrial revolution persist in today’s information-based economy.

Digital technology has the potential to do more. That potential lies in how digital capability reconnects physical and digital resources in ways that could not have been imagined when substituting bits for atoms constituted the core of a digital strategy. Rather, having a strategy based on the different relationships between physical and digital resources gives an organization an edge grounded in building a viable and valued digital business.
Appendix I:
Industry Averages for Levels of Revenue Generated by Digital Resources

The table below reflects responses from more than 2,000 firms to a survey conducted by Gartner Executive Programs in 2011. The figures provided represent responses for each industry on a global basis.

Figure A1.1 Levels of Firm Revenue Generated via Digitalized Resources

<table>
<thead>
<tr>
<th>Industry</th>
<th>None</th>
<th>Slight 1 - 24%</th>
<th>Significant 25 - 49%</th>
<th>Majority 50 - 79%</th>
<th>Dependent 80 - 100%</th>
<th>Industry Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>23%</td>
<td>65%</td>
<td>6%</td>
<td>0%</td>
<td>6%</td>
<td>9%</td>
</tr>
<tr>
<td>Airlines</td>
<td>6%</td>
<td>55%</td>
<td>22%</td>
<td>6%</td>
<td>11%</td>
<td>26%</td>
</tr>
<tr>
<td>Automotive</td>
<td>21%</td>
<td>61%</td>
<td>12%</td>
<td>3%</td>
<td>3%</td>
<td>13%</td>
</tr>
<tr>
<td>Banking</td>
<td>4%</td>
<td>45%</td>
<td>14%</td>
<td>11%</td>
<td>26%</td>
<td>40%</td>
</tr>
<tr>
<td>Broadcast Media</td>
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<td>0%</td>
<td>10%</td>
<td>40%</td>
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</tr>
<tr>
<td>Capital Markets</td>
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<td>14%</td>
<td>28%</td>
<td>40%</td>
</tr>
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<td>Construction</td>
<td>39%</td>
<td>39%</td>
<td>4%</td>
<td>11%</td>
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<td>Consumer Products</td>
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</tr>
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<td>48%</td>
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<td>14%</td>
<td>14%</td>
<td>30%</td>
</tr>
<tr>
<td>Education: Higher</td>
<td>13%</td>
<td>55%</td>
<td>11%</td>
<td>13%</td>
<td>9%</td>
<td>24%</td>
</tr>
<tr>
<td>Entertainment Media</td>
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<tr>
<td>Government: State/Local</td>
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<tr>
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<tr>
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<tr>
<td>Global Average</td>
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<td>49%</td>
<td>11%</td>
<td>10%</td>
<td>14%</td>
<td>27%</td>
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</table>

Source: 2012 MIT Sloan Center for Information Systems Research and Gartner, Inc.
Appendix 2:  
The Elements of a Digital Platform

A digital platform is the collective environment supporting the digital capabilities and customer experience. Figure A2.1 and the elements described below represent a collection of digital resources the organization draws upon to create, support and extend digital capabilities.

This is a general model, as each organization will develop its own digital platform based on current capabilities and future strategies and investments. The model seeks to be as comprehensive as practical to give organizations a sense of the elements involved in building a digital edge. Not every organization will build every element, nor are all elements mandatory. Organizations will adjust this model based on the maturity of their current operations, investment levels, partner and sourcing arrangements, and digital goals and strategies.
This appendix provides a description of each of the elements within this model, starting at the top center with outcomes and experience and ending with the management, monitoring and performance architectures. The layers within the model seek to use terms currently found in organizations, such as architecture and infrastructure, as well as provide a sample inventory of each level in the bullet points shown in the figure above.

**Outcomes, Experiences and Capabilities** — This defines the business outcomes within the digital strategy; for example eliminating patient harm or delivering high-touch customer service. This level includes narratives, storyboards or other illustrations of the intended experience required to achieve those outcomes. A diagnosis of the business and operational issues related to the
outcomes is part of this level; for example, Royal Caribbean’s identification of chokepoints that create customer lines. Finally, this level includes a list of the initial digital capabilities involved in reaching this outcome.

**Interface-Device Architecture** — Describes the tangible aspects of a digital edge, the things people will see, touch, interact and integrate with in utilizing digital capabilities. While the primary focus of the interface is human (i.e., app user interfaces, digital signage, etc), this level includes the machine-to-machine interfaces ranging from application programming interfaces (APIs) to sensor and other device-to-device communications. The interfaces are the visible aspects of the customer experience and business outcome.

**Information and Knowledge Architectures** — Represent the structure of information and knowledge in the organization. Information includes the structured information and information or record normally associated with existing transaction systems, data models and repositories. This level outlines the unstructured information involved in realizing the business outcome and experience supported by social media, video, images, audio, etc. Since this information supports the customer experience, it should also consider the capture and management of customer feedback and testing results.

**Commerce Architecture** — Normally considered part of a separate business design, a digital platform includes descriptions of how digital capability, customer value and revenue come together in products, services, offerings and pricing. This architecture can include a high-level description of the product value propositions, business plans and revenue models. It should provide guidance on how customer value, created by digital capabilities, becomes company revenue and results.

**Business Process Architecture** — Identifies the end-to-end business activities involved in creating the outcome and experience. This level contains the business process designs and architecture found in most organizations. Business process designs for digital capabilities should pay particular attention to business rules, tasks and operational performance levels, as many of these elements will be supported either via devices like smartphones or supplied by third-party services.

**Channel Architectures** — Capture the different paths or models for business interaction and engagement. Channels range from direct person-to-person interaction to person-to-device and device-to-device models. This layer describes each channel that will use the digital capability to create the outcome, as well as the partners involved in that channel.

The channel architecture describes the environment for executing the business processes in support of the outcome and goal. Different channels will place different requirements on each level, as customers interacting via mobile devices are not exactly the same as working with associates at the organization’s place of business. Technology and communications infrastructures support the channel architecture.

**Technology Infrastructure** — Represents the hardware, systems, data centers and other technical elements underpinning the digital capabilities and business operations. These are the physical resources supporting digital technology. Organizations will source the majority of the technical infrastructure elements via cloud services and other technology-provisioning models.

The technology infrastructure forms the foundation of digital capabilities, their extension into the customer experience, and integration with existing operations and trading partners.
Communications Infrastructure — Describes the connectivity required to realize a digital edge. The communications infrastructure predominately consists of standards-based purchased services. Communications provides the nervous and signaling systems for information, devices, telemetry and messaging networks. These services support the transmitting of voice, data, video and images, along with related encryption and security protocols.

Security, Privacy and Trust Architectures — Represent concerns that exist throughout the digital world and across all of the elements in a digital platform. This aspect of the platform provides services supporting the core elements required for a secure, reliable and high trust digital environment.

Management, Monitoring and Performance Architectures — Form the core of the business rationale and management structures for leading and managing a business based on digital edges. The tools and elements here include strategy, budgeting, performance models and targets which should be tailored to be consistent with the nature of the outcome and experience associated with the digital capabilities.

The elements represented in this Appendix define a range of items incorporated into a digital platform. Each organization will create, source, operate and share these elements based on their individual strategies, investment plans and capabilities.

Who owns and controls each level of the platform will change with time, business and technical innovation. Over time and with cloud and new service-based digital technologies, organizations will increasingly acquire these elements either from sourcing partners or from customers themselves. Regardless of their source, these elements describe the resources involved in creating a digital platform.
Appendix 3: Technology Advisory Board of Directors Charter

The sample charter below represents the synthesis of multiple charters from different organizations and industries. These charters were published on the Internet and in the public domain. The sample charter does not represent any one firm. It is provided to serve as a starting point to consider the purpose, responsibilities and accountabilities of a board-level committee concentrating on technology and innovation.

Purpose
The purpose of the Technology and Innovation Oversight Committee is to:

• Provide oversight and counsel on matters of innovation and technology
• Recommend on major strategies and subjects related to technical and commercial innovation
• Appraise major innovation and technology-related projects and architecture decisions
• Recommend and advise on innovation and technology acquisition processes
• Ensure that the Company’s innovation and technology programs effectively support the Company’s business objectives and strategies
• Advise the Company’s senior IT management team and the Board of Directors on innovation and technology-related matters.

Membership and Subcommittees
The Innovation and Technology Oversight Committee shall consist of members of the Board of Directors as shall be appointed by the Board from time to time, but in no event shall the Committee consist of fewer than three members.

The Board of Directors shall designate the Chairperson of the Committee. The Board of Directors may change the membership of the Committee at any time.

Unless otherwise prohibited by the Company’s Certificate of Incorporation or Bylaws, the Innovation and Technology Oversight Committee may form and delegate authority to any subcommittee as it deems appropriate or advisable.

Functions, Powers and Responsibilities
The Innovation and Technology Oversight Committee shall:

Projects

• Appraise and critically review the financial, tactical and strategic benefits of proposed major projects and technology architecture alternatives.
• Appraise and critically review the progress of major technology-related projects and technology architecture decisions.
• Make recommendations to the Board of Directors with respect to technology-related projects and investments that require Board approval.
Security
• Monitor the quality and effectiveness of the Company’s technology security.
• Periodically review and appraise the Company’s technology disaster recovery capabilities.

Internal Controls
• Monitor the quality and effectiveness of technology systems and processes that relate to or affect the Company’s internal control systems.
• Periodically report to and consult with the Audit Committee of the Board of Directors regarding technology systems and processes that relate to or affect the Company’s internal control systems.

Advisory Role
• Advise the Company’s senior management team on innovation and technology issues.
• Stay informed of, assess and advise the Company’s senior management team with respect to new technologies, applications and systems that relate to or affect the Company’s innovation and technology strategy or programs.

Other
• Unless the Committee determines that fewer meetings are required, the Committee will meet at least two (2) times per year.
• Annually review the Committee’s own performance, and report the results of such review to the Board of Directors.
• Annually review and reassess the adequacy of this charter and recommend any proposed changes to the Board of Directors for approval.
• Report regularly to the Board of Directors on matters within the scope of the Committee, as well as any special issues that merit the attention of the Board.
• Perform such other duties as are necessary or appropriate to ensure that the Company’s innovation and technology programs effectively support the Company’s business objectives and strategies, or as the Board of Directors may from time to time assign to it.
THE STORY OF THE BOOK

Two books, published more than 15 years apart, describe the world we live in and the challenges we face in the future. They provoked the investigation and development of the thoughts in this book.

The first book, *Being Digital*, by Nicholas Negroponte, was published in 1996 and introduced the ideas underpinning the first wave of digitalization — the Internet and e-commerce. Negroponte pointed out the superiority and preference for creating value by changing atoms into bits. It is one of the books that kicked off the Internet revolution, driving people to discount their physical assets in favor of their virtual copies.

The second book, *Race Against the Machine*, by Eric Brynjolfsson and Andrew McAfee, was published in 2012. This book discusses the economic, employment, social and business implications of current and emerging digital technologies. The authors point out that these implications are just emerging — technology capacities and capabilities are set to become even more powerful.

Digital technology will not change the way we do business; it will change the way everything works.

Taken together these two works lay out a series of critical questions that political leaders, business leaders and individuals must address:

*How do we win the coming race against the machines?*

*What is the nature of the digital world?*

*How do we build a world that we all want to live in?*

These questions reflect different views on the digitalization of business, the world and ourselves. The first question, “How do we win the coming race against the machines?” assumes a form of “digital alchemy”—an equivalent exchange among inputs where victory for technology capital requires a loss for human labor. Looking at technology in a win/lose frame produces polar examples that deny a rich set of opportunities in finding the right combinations of digital and physical resources.

We have seen what happens when we separate the digital from the physical, and now it’s time to think about the possibilities of new combinations of the two. That is the essence of the “extract, infuse and innovation” process discussed in this book. It provides a general answer to the question of how to best bring together these two worlds. The five models of a digital edge provide further detail and form the focus of the second part of the book.

Regarding the second question, the nature of the digital world is complex, evolving and significantly more nuanced than what can be captured in common terms like commoditization, crowdsourcing or intelligent things. It is a nature that goes beyond just translating atoms into bits. Rather, it looks at how digital technology changes the fundamentals of customer value, company revenue and competition.

The ideas expressed here — the ideas that constitute a digital edge — envision a world of possibility created by digital capabilities derived from combining the digital and physical worlds. This book studies firms that created these capabilities to drive outcomes that benefit their customers, people and business.
All digitalization is physical, to borrow a phrase from politicians, who say all politics are local. The physical dimension of products, solutions, experience or performance creates a difference that drives value and transcends electronic commoditization.

Every edge has two sides. An edge cannot exist without both. In the case of digitalization, different combinations of physical and digital resources create the edge. The ideas in *The Digital Edge* form a general response to the accelerating opportunities of digital technology. This book explains an approach for gaining an edge that amplifies the enterprise and its strategy rather than driving the world into further blind automation and commoditization that is neither sustainable nor desirable.

Answering how we bring the digital and physical worlds together addresses the last issue — building a world that we all want to live in. A world of pure digitalization is a world in which labor becomes commodity and capital becomes king. That world, highlighted by Brynjolfsson and McAfee, distorts economic, social and business marketplaces. It is a world where the best we could hope for is a life on the space-ship Axiom, featured in the movie *Wall-E*, where humans are well-fed, entertained and warehoused under the guidance of technology.

We need new ways of thinking about and applying technology, information, behavior and choice. This book provides a business approach and process that forms part of the answer to these three questions. In doing so, it aims to help organizations leverage the digital world to create a sustainable edge in this new era we live in.
Chapter 1: Think Differently About Digital

1. The term digitalization seeks to capture the range of changes required in applying digital technology to business. These changes go well beyond capturing and manipulating information in a digital format — digitization.


5. Marty Miller, Children’s Hospital of Los Angeles, telephone conversation with Mark P. McDonald October 27, 2011.

6. Jon Stevens, CDW, in person interview with Mark P. McDonald on December 2, 2011.


8. Dave Bent, United Stationers, Inc. an interview with Mark P. McDonald on February 1, 2012.


10. A breakdown of global industry averages based on the 2010 Gartner Executive Programs CIO Survey is in the appendix.

11. Wikipedia. “List of countries by number of mobile phones in use.”


Chapter 2 Defining Value at the Edge

1. Marty Miller, Children’s Hospital of Los Angeles, telephone conversation with Mark P. McDonald October 27, 2011.


15. Dave Bent, United Stationers, Inc. an interview with Mark P. McDonald on February 1, 2012.

16. Mike McDonnell and Matt Bonnes, IONX, Inc. an interview with Mark P. McDonald on November 16, 2011.
Chapter 3: Creating Addressable Revenue


3. Dave Bent, United Stationers, Inc. an interview with Mark P. McDonald on February 1, 2012.


Chapter 4: Creating Digital Disruption

1. Based on an interview with, and materials from, the Harry Fox Agency, September 2011.


3. Dave Bent, United Stationers, Inc. an interview with Mark P. McDonald on February 1, 2012.

Chapter 5: Finding the Right Digital Edges

1. Mike McDonnell and Matt Bonnes, IONX, Inc. an interview with Mark P. McDonald on November 16, 2011.


3. Hung LeHong, a conversation with Mark P. McDonald on September 5, 2012.

Chapter 6: Automating With Digital Technology


2. See SFPark.org for details of the solution operating in the Mission Bay Area.

Chapter 7: Applying Digital to Change Resource Requirements

1. Bill Howard. “Self-driving Google cars: 300,000 miles, 0 crashes — if only your PC was as stable.” August 10, 2012. ExtremeTech.com


Chapter 8: Accompanying Digital Resources to Support New Experiences


3. Jon Stevens, CDW, in person interview with Mark P. McDonald on December 2, 2011.

4. The analogy refers to comparing the high touch service of an expensive jewelry store with the prices found at a discount retailer. A comparison outside the United States might be “Boutique service at a High Street price.”

Chapter 9: Augmenting Human Ability and Capacity


3. Marty Miller, Children’s Hospital of Los Angeles, telephone conversation with Mark P. McDonald October 27, 2011.

Chapter 10: Abstracting Information, Behavior and Value


2. Dave Bent, United Stationers, Inc. an interview with Mark P. McDonald on February 1, 2012.
Chapter 11: An Approach for Building Digital Capabilities

1. Jon Stevens, CDW, in person interview with Mark P. McDonald on December 2, 2011.


Chapter 12: Diverse Teams Create Powerful Digital Solutions


Chapter 13: Innovating the Organization for a Digital Edge

1. Dave Bent, United Stationers, Inc. an interview with Mark P. McDonald on February 1, 2012.

2. Dave Bent, United Stationers, Inc. an interview with Mark P. McDonald on February 1, 2012.

Chapter 14: Road Map for a Digital Edge


The Story of the Book


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Mark P. McDonald is a group vice president and Gartner Fellow with Gartner Executive Programs, where he works with executive teams on applying technology to achieve business results. Prior to working for Gartner, he was a partner at Accenture, responsible for that company’s Center for Process Excellence.

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ABOUT GARTNER

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THE END