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Winning in the Digital Economy
A New Focus for the CIO

IT Advantage

Preface

Digitization is transforming business. It has already changed the structure of several industries and the way that many companies compete—and its reach will only expand. Indeed, BCG research reveals that, in the G-20 countries, the Internet economy is likely to reach $4.2 trillion in 2016, up from $2.3 trillion in 2010. Over the same period, the Internet is expected to gain more than a billion new users, its reach extending to nearly half the world's population. Seizing the opportunities this affords will demand many capabilities, perhaps none more important than optimized IT. In fact, the potential for IT to affect a company's competitive trajectory has never been greater.

This issue of *IT Advantage* touches on several facets of the intersection of digitization and IT. It features an article on how the digital revolution is reshaping the mandate of today's CIO, who needs to understand how and where digital forces are affecting IT and what opportunities the new technologies can bring to the business. It also includes a related article that posits the need for IT organizations to develop a "second gear" of IT, one focused on the company's digital efforts and capable of operating at digital speed.

Another article concerns a direct product of digitization that has the potential to broadly reshape IT practices: cloud computing. A recent BCG survey at larger companies revealed that CIOs are deploying cloud services increasingly aggressively. Yet they do not see the cloud as a panacea. This article summarizes the survey's findings.

We also offer two articles arguing for a strategic approach to data collection and management. The first is centered on how such an approach can enable value-based health care. The second discusses how governments can maximize the value to society of the data they collect.

Finally, we include two articles on IT transformation. One focuses on how financial institutions are using the Innovation Value Institute's IT Capability Maturity Framework to better understand and improve the effectiveness of their IT. The other is an interview with Pierre Dulon, CIO of Crédit Agricole CIB, who discusses how he applied lean principles to the IT function.

I hope you enjoy this issue of *IT Advantage* and welcome your comments. Please send any feedback to ITAdvantage@bcg.com.

Thomas Reichert
Global Leader, Information Technology Practice

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WINNING IN THE DIGITAL ECONOMY

A NEW FOCUS FOR THE CIO

by Melanie Bockemühl, Frank Felden, Antoine Gourévitch, and Richard Helm

THE DIGITAL ECONOMY HAS clearly arrived. For consumers, it means the ability to interact with the world—both virtual and real—in a far richer way, anytime, anywhere. For companies, it means dramatic changes to operations and the opportunity to gain far greater insight into customers and to convert this insight into value. For CIOs, it means tackling an increasing number of day-to-day challenges—in channels, operations, information manage-ment, and innovation—in the face of a revolution that is rewiring those challenges.

To help companies play and win in the digital economy, today's CIOs need to understand how and where digital forces are affecting IT and what opportunities the new technolo-gies can bring to their business. Un-less CIOs are actively engaged in these changes, they may not be able to support the new demands that will be placed on the company. In this ar-ticle, we survey four important areas on which CIOs should focus in order to help their organizations capture opportunities in the digital economy. (See Exhibit 1.)

Changing Venues: Your Business in the Palm of Your Customer's Hand

The ubiquity of mobile devices means that the venue of interaction

EXHIBIT 1 | Digital Economy Requires a New Focus for the CIO

Changing venues: your business in the palm of your customer's hand
- Integrate digital and physical channels
- Define a road map that delivers value quickly
- Ensure capacity for new volumes and a mix of transactions

Digital operations: reconfiguring how and where work happens
- Create flexibility in systems and provide access
- Provide data access and distribute work efficiently
- Enable the marketing function

Information advantage: the Internet of people, places, and things over time
- Capture new, valuable data from digital apps
- Match internal and external data for insight
- Enhance analytic systems

Organizing for two-speed IT: fostering new capabilities and innovation
- Adopt new processes and tools
- Strengthen teams with diverse talent to innovate
- Foster innovation from outside

Source: BCG analysis.

with customers now resides in the palm of the hand. Customers can access products and services on the go and increasingly expect companies to field and fulfill their requests immediately, wherever and whenever they want. Even traditional periods of downtime—while commuting, waiting in line, or sitting in front of the television—are now times when consumers pursue online activities. And these are not just passive activities,

happening rapidly. In some markets, online banking took a decade to capture 50 percent of transactions; in many markets today, the equivalent shift to mobile has taken just a year, with mobile now the dominant venue for banking.

Today's CIOs must work out how to balance day-to-day operations and project delivery with the new challenges they face. Getting it right

It is important to recognize the uniqueness of the mobile platform and to fully exploit its power and connectivity.

such as Internet browsing, but increasingly include active pursuits such as banking and shopping; indeed, for some banks, online banking spikes during popular TV shows. As consumers search for information, make purchase decisions, place and track orders, or receive service and support, they demand a seamless journey back and forth across physical and digital channels. And they expect relevant, socially engaged, location-specific interactions on whatever device they choose to use.

These new interactions and expectations have important implications. Companies can no longer simply replicate functions from one channel to another. Instead, they must consider the distinct roles of each channel for their customers. Every industry faces unique issues in delivering a consistent customer experience. For example, in retail, companies must work through the logistical and management challenges presented by customers returning online purchases to physical stores and the impact of this trend on a store's metrics of sales versus returns.

This profound change in the interface between customers and companies is

means creating technology platforms equipped to deal with the rapid changes being wrought by the digital economy. Getting it wrong will put the company in the position of having to constantly react to change, with IT being seen as the problem rather than the solution. In BCG's experience, CIOs must do the following in order to deal successfully with these challenges:

- *Systematically evaluate how well the company's systems across both digital and physical channels support customers, and define a course of action to address problems and gaps.* This goes beyond simply replicating capabilities and functions across channels. In the past, many companies made the mistake of treating mobile as a simpler version of the online channel, with a smaller form factor. It is important to recognize the uniqueness of the mobile platform and to fully exploit its power and connectivity, as well as the intimate role it plays in consumers' daily life. Meeting those demands will require core services delivered through channels and enterprise systems to be altered and reshaped.

- *Set out the target state for the company's technology and a pragmatic, multiyear road map that delivers value quickly.* The plan must put in place building blocks and capabilities for the long term, while also giving the company enough flexibility to respond to the next wave of digital capabilities. Lessons from the dot-com decade should be heeded. In their urgency to become digital, businesses must avoid creating technical and operational silos that diminish their ability to integrate across channels and that subsequently require rework and reintegration.

- *Be prepared for a significant increase in transaction volumes and a changing mix across channels.* The take-up rate and shift in digital services can be rapid, exceeding many capacity plans, so it pays to be prepared. Loss of service is unacceptable when customers increasingly expect 24-7 service. Cost-effectively managing average and peak loads will be critical, as will new capabilities to predict demand and match supply from new infrastructure-sourcing models.

Digital Operations: Reconfiguring How and Where Work Happens

Digital is also changing business processes inside the workplace, whether by eliminating paper or by providing up-to-date mobile information to inform the decisions and activities of employees wherever they are during the 24-hour operations cycle. This is not just about supporting a bring-your-own-device policy; rather, it is about freeing employees from being desk-bound and helping them access information and perform functions on devices directly linked to core platforms. Examples of these new practices abound. A large retailer is

already using mobile devices with an attached bar-code scanner to manage its inventory, and a bank is using mobile devices to help staff spend more time with customers, to manage the flow of sales, and to reduce queuing in the branch. Yet another company is leveraging its sizable workforce to provide customer support via Twitter, gaining a competitive advantage over pure-online retailers. The CIO has a role to play in supporting an organization's internal digital operations by focusing on the following:

- *Embedding Flexibility in Systems to Support Different Business Configurations.* How and where employees work is in flux as businesses reconfigure themselves for the digital economy. As a result, functions once performed in physical locations may move online, back-office support functions may move to the front office, and call center activities may move to customer self-service. The design challenge is to avoid implicit assumptions in operating systems about who does what work where using what device. Instead, flexibility must be embedded in the design across systems, from the user interface and device to the system authentication and authorization processes.

- *Systematically Providing Access to Information and Distributing Tasks Among Workers Wherever They Are.* Many employees still need to be physically located near the paper-based files that are the basis of their work. Typically, companies manage the activities of staff using tools like document imaging and process workflow. While these approaches are well suited to complex, long-running processes such as insurance claim processing, simpler activities, such as placing or reviewing the status of an order, can benefit from a move to digital alternatives.

Digital operations allow workers to move away from filing cabinets and closer to the customer, giving them access to the information they need on a variety of desktop and mobile devices and allocating work and approvals across locations and teams using task management platforms that improve productivity, responsiveness, and costs.

- *Building Skills and Capabilities to Support the Delivery of New Digital Services Across Increasingly Diverse Devices, Form Factors, and Operating Platforms.* A device-agnostic approach limits the ability to readily exploit the unique features of each type of device. If and until industry standards emerge, a device-specific approach risks significantly increased costs to support multiple platforms. A considered plan is required that focuses on the penetration of different devices in specific markets in order to balance the tradeoffs among richness, reach, and utility.

- *Supporting the Needs of the Marketing Function.* In order to execute new campaigns, marketing increasingly requires the IT function to provide new marketing and information platforms that integrate social media and customers' social graphs. IT must also provide digital listening solutions to monitor feeds and user-generated content, as well as information services to participate in augmented search. This will require new building blocks in a digital-ready IT architecture and new points of integration with traditional IT.

The digital economy will clearly force significant changes on an enterprise's systems and architecture. The challenge will be to understand these changes in sufficient depth to create

a pragmatic multiyear road map that delivers value quickly but also puts in place the building blocks and capabilities for the longer term. This is of particular importance when addressing the advantage to be gained from the new types of information available in the digital economy.

Information Advantage: The Internet of People, Places, and Things Over Time

Today's smartphones and tablets are incredibly powerful, connected, and rich in features. Equipped with almost a dozen sensors, they can determine their own location and respond to audio, voice, touch, kinetic, and visual inputs. Because these devices generate such a wealth of information at every interaction, their utility to their owners is potentially dwarfed by their value to the business. (See Exhibit 2.) Each interaction generates an associated "event" that potentially offers a company information about the following:

- *People:* those accessing the service, their relationship to the company and to others with whom they interact—through e-mail, social media, and contacts

- *Place:* the location where the interaction occurs and what and who is there and nearby

- *Things:* the objects the device is interacting with

- *Time:* when the event occurred

By themselves, these events are of little interest. But in aggregate, they offer companies the chance to gain significant insights into their customers. More important than an individual's attributes is the relationship among individuals and the ability to infer customers' behavior on the basis of their interactions, social networks, and location.

EXHIBIT 2 | The Internet of People, Places, and Things Over Time

- Personal identity and data volunteered or observed
- Relationships with other individuals and communities

People

- What is mine?

- Where am I?
- Where are my friends?
- Who is near me?

Things

Places

- What is there?
- Where is it?
- What is nearby?

- Objects with links to information about them
- Objects that sense, record, and transmit their status

- Geographic positions
- Aligned to maps, images, and information about what is there

Over time

- Where have I been?
- Where has it been?
- What happened to it?
- Who was where and when?

- Time-stamped events

Source: BCG analysis.

One of the competitive dynamics in the digital economy is the fight to control this rich stream of data. Companies need to find ways to exploit this information in order to influence customers' current and future actions. Done poorly, these efforts can lead to missed opportunities to understand customer behavior or to breach-of-privacy issues. Done well, they can provide companies—and especially incumbents—with new opportunities to offer customized services and to optimize their physical and digital footprints.

To develop the ability to capture, analyze, and exploit this information, CIOs must focus on the following:

- *Ensuring That the Strategy for Mobile Applications Includes a Focus on Information.* Mobile solutions and apps must provide a useful service. But companies often overlook the question of what value can be gained from the information that these applications generate. Data about people, places, and things accumulated over time can be used to improve marketing, optimize channels, gain insights into customers, and improve operations. Assessing the potential value of this information must be part of every design. The overall design of mobile apps must also include sufficient capacity to capture, store, and analyze this potential flood of information.

- *Integrating the Data Generated by Mobile Devices with Existing Internal Data.* Data from mobile apps is doubly valuable when analyzed in combination with existing information about customers. Such analysis is the source of one of the greatest advantages of incumbents, which—compared with new entrants—can augment new data with an especially rich base of historical information. This ability presents opportunities for fresh insights into existing customers, behaviors, and relationships that can inform marketing, and fresh insights into channels and operations that be used to further optimize internal resources and the physical footprint. But ensuring that all these sources of data are aligned and of sufficient quality requires that companies first address issues of data coverage, accuracy, completeness, and consistency.

- *Extending the Existing Information Strategy and Road Maps to Include Digital.* Digital must be a core element of a company's information strategy in order to exploit the value of this rich source of new customer and operational insights.

Organizing for Two-Speed IT: Fostering New Capabilities and Innovation

In the digital economy, barriers to entry are low for new entrants, digital agencies, and startups. All have ready access to content, development tools, and low-cost, scalable, cloud-based computing infrastructure that make it far easier now than in the past to innovate and deploy solutions quickly.

In this environment, there is a risk that companies will bypass IT and create the silos and fragmented IT systems that were typical of the dot-com days, as well as the subsequent costs involved in reintegrating these solutions into operations.

The IT organization needs two speeds of service delivery. The first—"industrial" speed—is the optimized speed at which IT, in its customary role, can deliver service to the business. The second—digital speed—is the speed necessary to enable and drive the company's digital agenda. (See "Two-Speed IT: A Linchpin for Success in a Digitized World," on the next page.) CIOs can help their business organize for two-speed IT by doing the following:

- *Set up the processes and tools for projects, solution delivery, and testing so that they support different streams of development.* This will help the organization actively manage the tradeoffs between innovation and speed, on the one hand, and the production risks that arise from rapid change to core business systems, on the other.

- *Change the mix of internal skills and external partners.* Successful innovators bring together staff with very diverse backgrounds and talents. They establish new vendor partnerships to source technical and online industrial-design skills and expertise. They complement this by interacting with communities and engaging startups rather than doing everything in-house.

- *Foster innovation through open networks, opening up the business and the IT organization to new ideas from citizen innovators, volunteers, customers, and followers keen to interact with brands and products.* Today, a small number of companies are creating innovation funds, offering prizes to startups for innovations in channels, services, products, and community involvement. Social media provide the platform, and participation increases engagement and creates advocates for tech-savvy consumers.

THE IT organization will be at the forefront of those companies that win in the digital economy. As more and more customers, and more and more companies, join the race, the CIO will be expected to support and help set the direction for this transition. The new focus for the CIO will be on developing clear insights into how to extract value for the business from the rich sources of information and opportunity now available.

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TWO-SPEED IT
A LINCHPIN FOR SUCCESS
IN A DIGITIZED WORLD

by Antoine Gourévitch, Benjamin Rehberg, and Jean-François Bobier

DIGITIZATION IS TRANSFORMING LARGE swaths of the business landscape. Seizing the opportunities and managing the risks that emerge demand a range of capabilities across the enterprise. One of the most critical is optimized IT. IT supports all business functions and is a key enabler of the speed and agility necessary for digital success. Yet many IT organizations remain mired in predigital-era thinking and practices. As a result, they may be failing to meet the business's expanding needs, at a cost to both the company and their position within it.

IT organizations, led by the CIO, need to rethink their value proposition in light of today's digital realities. Specifically, they need to consider developing a "second gear," one focused on the company's digital efforts and capable of operating at digital speed. Achieving this while continuing to support the business in its customary role may be a tall order for many IT organizations. It will necessitate rethinking how the IT function is organized and governed. It will also entail significantly retooling its capabilities. But the payoff for successfully transforming IT in this manner, both to the IT organization and to the company as a whole, stands to be vast.

What might that payoff look like? Consider the real-world example of a bank that recently upgraded its webpage. Users' reaction on Facebook and Twitter was unanimous—they did not like it. The bank responded immediately. By the end of the week, it had made a range of changes to the site based on customers' feedback, winning itself praise for both its willingness to listen and its quick response. The bank's ability to execute in this manner was no fluke. It was enabled by an IT organization that had consciously developed a second speed, one much faster than the normal pace of IT delivery.

The Need for Two Speeds

Given its mandate and familiarity with the terrain, the IT organization should, logically, drive or have a hand in every digital initiative. Yet frequently that is not the case. Many corporate digital efforts today are being launched and managed by the business side, with little or no input from the company's IT organization (similar to what occurred more than a decade ago in the dot-com era). In many companies, for example, the business deals directly with suppliers, such as advertising agencies and service providers (salesforce.com, for example). It is also unilaterally engaging third parties to build internal digital capabilities, such as big-data functionality, that broadly support the company and online services (for example, the launch of a Facebook fan page) that support individual products.

Why would the business bypass IT? Concerns over perceived shortfalls in IT's capabilities

and skills is one reason. Dissatisfaction with IT's organization and governance is another. The business often finds it easier and faster to secure funding for digital initiatives when it does not involve internal IT. It also finds that interactions are more fluid, and projects get completed more quickly (or get completed, period), when it opts for third parties over the company's IT function. The downside of the business acting on its own can be sizable, however, and includes fragmented solutions, one-off efforts that are difficult to integrate throughout the company, unnecessary duplication of efforts, and inconsistent branding.

Realistically, the business is not entirely wrong in its assessment. Most IT organizations are used to engaging with the business in a specific manner. But the model necessary for success in the digital realm is different. Digital initiatives operate outside IT's standard project methodology and portfolio-management practices. They call for dedicated teams that are staffed with jacks-of-all-trades rather than specialists. They can also demand the leveraging of ecosystems that are outside traditional IT control, whether it be a social-media platform such as Facebook, Apple's iPhone operating system, or an external cloud platform shared with a third party.

IT organizations need to overhaul their support model to adjust to this new paradigm. A critical element is recognizing that IT needs two speeds of service delivery. The first, which we refer to as industrial speed, is the optimized speed at which IT, in its customary role, can deliver service to the business. The second—digital speed—is the speed necessary to enable and drive the company's digital agenda. (See Exhibit 1.) This is the capability that most IT organizations need to build—and build quickly.
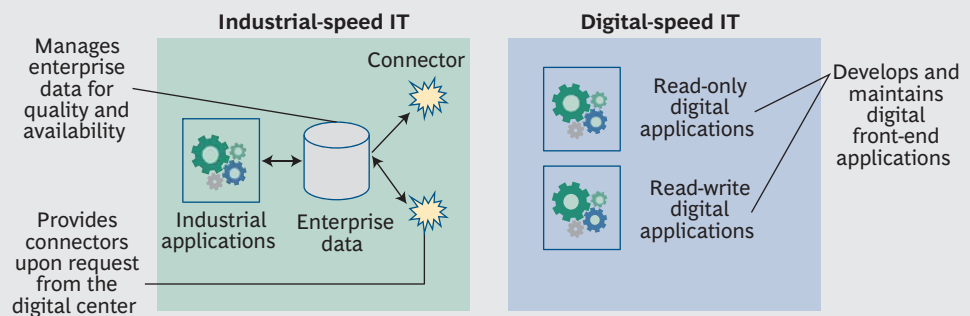
Building Digital Speed

To create this second speed, many IT organizations will have to develop a standalone entity within IT that is devoted solely to digital initiatives. This requirement reflects the considerable differences—in orientation, demands, and required capabilities—between the provision of industrial-speed IT and digital-speed IT. Industrial-speed IT, where the primary emphasis is on cost optimization rather than flexibility, is characterized by predictability, long lead times, and siloed, functionally organized teams of individuals who possess specific skills. Digital-speed IT is characterized by unpredictability and places a premium on flexibility, speed, and collaboration. (See Exhibit 2.) There are clear tradeoffs between the two in cost, flexibility, and required quality.

Staffing and governing the digital arm is thus a considerably different challenge than doing so for the traditional IT organization. The ideal candidate for the digital-speed team is not an IT specialist but rather a jack-of-all-trades who has both excellent technical skills and functional knowledge. He or she should have the orientation and aptitude to design

EXHIBIT 1 | Industrial- and Digital-Speed IT Serve Different Purposes

Industrial speed provides connectors, digital speed owns front ends

Industrial-speed IT

Manages enterprise data for quality and availability

Connector

Industrial applications

Enterprise data

Provides connectors upon request from the digital center

Digital-speed IT

Read-only digital applications

Read-write digital applications

Develops and maintains digital front-end applications

Source: BCG analysis.

and implement a prototype in a few weeks, propose innovative solutions, and challenge the business when necessary. The individual should also be comfortable operating in an environment where there is a high degree of uncertainty.

Governing the digital-speed organization also calls for a different approach. The governance for digital projects needs to be streamlined to enable reactivity and flexibility. This means employing more-flexible demand management and a more flexible budgeting and resource-allocation process. It also means adopting a more agile project-development methodology.

Note that while the digital organization, once established, will take the lead in supporting the business's digital agenda, industrial IT will play a discrete role as well. Digital initiatives can be broken down into two categories. The first consists of autonomous digital applications, such as viral-marketing efforts, that do not require any connection with corporate information systems. For such projects, industrial IT may or may not be involved. The second category is digital applications that require access to enterprise data or systems—for example, mobile applications that give customers the ability to modify personal data. Here, both industrial IT and digital IT play critical roles. Industrial IT will pro-

EXHIBIT 2 | The Two Speeds Have Different Characteristics and Demands...

	Industrial speed	Digital speed
Applications	Mature and built-on technologies that have long life cycles	Emergent, short lifetime, and built-on fast-changing technology combined with legacy technologies
Speed and cycle time	Release cycles of 6 to 12 months driven by planned business needs	Quick cycles—less than one month from idea to deployment—driven by rapidly changing user needs and competition
Methodology and tools	A hierarchical organization using established programming languages and frameworks and standardized testing and approaches to design	Self-organizing teams using agile tools, fast-evolving software-development kits, and automatic unit testing
Skills	Individuals with specialized skills: business analysts for requirements and developers for technical implementation	Jacks-of-all-trades who combine up-to-date knowledge of technologies and business orientation

... and Different Relationships with Stakeholders

Customer to business	Demands are predictable and based on established channels, products, and processes	Demands are unpredictable due to evolving trends, technologies, and channels
Business to IT	Siloed and fenced; requirements are relatively stable, driven by mid- and long-term business strategies	Highly collaborative, which is necessary due to fuzzy, hard-to-define, contantly changing (customer driven) requirements
IT to IT	Siloed, fenced, and vertically integrated; the technology stack is fairly stable	Collaborative and horizontally integrated; the technology stack is contantly evolving
IT to third parties	The typical buyer-vendor relationship; IT controls the pace of the interaction	Participation in third-party ecosystems (for example, those of Apple and salesforce.com); the ecosystem sets the pace

Source: BCG analysis.

vide data and standardized services to digital IT; digital IT, in turn, will provide the front-end application to the business.

In all cases, the need for high-quality, secure data will remain paramount to the business as it pursues its digital aims. The CIO can play a vital role as keeper and champion of the company's data, both in building the necessary systems and in communicating the new imperatives and opportunities to users through appropriate change-management channels.

New Mandates for the CIO

As CIOs adapt to the demands of two-speed IT and, more broadly, seek to optimize their IT organizations to an increasingly digitized business landscape, there are steps they can take to advance their cause, including the following:

- *Identify and empower jacks-of-all-trades.* Look for technological experts who have business knowledge, are able to quickly develop prototypes, and can challenge the status quo. Embed them within IT but have them report on a dotted line to the business for the duration of their projects. Give these experts business objectives and also the license, time, and resources to try new things. Let them use emergent technologies if doing so can help them bring ideas to fruition faster than the company's competitors.

- *Build speed and flexibility by fostering an agile IT environment.* Strive to ingrain a philosophy of "fewer features sooner" and "fail fast, fail often." Infuse agile principles and elements into all areas, even ones where traditional approaches will prevail.

- *Develop communications networks among customers, the business, and IT.* Enable organized as well as ad hoc collaboration across internal hierarchies and silos. Actively seek out customer feedback through social media, and expand the company's innovation horizon by crowd-sourcing ideas.

- *Build upon external platforms; don't reinvent the technological wheel.* Skew strategy toward consuming services found in third-party ecosystems rather than creating those services internally. Gain from and contribute to the broader external community (by, for example, contributing to the development of open-source software).

It is critical that, in implementing these measures, CIOs maintain a long-term perspective. Eventually, all digital applications will fall into the mainstream IT portfolio, as happened with Web 1.0 efforts. CIOs should learn from the mistakes of that era and avoid making similar ones. Specifically, CIOs should focus on assembling the right talent, emphasizing younger staff with potential over highly paid CTOs and CMOs. They should also continue to stress maintainability and security as they guide the company's digital-related efforts. And they should plan for the eventual handover of digital applications from the business to IT and map out a prospective timeline and IT staff roles and responsibilities.

Capturing the advantages offered by the digital age demands changes throughout the company. The IT organization, in particular, needs to reinvent itself. Developing a second speed of delivery should be a key aim of that reinvention.

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TRANSFORMING IT WITH LEAN

AN INTERVIEW WITH PIERRE DULON, CIO OF CRÉDIT AGRICOLE CIB

Pierre Dulon is the chief information officer of Crédit Agricole Corporate & Investment Bank (Crédit Agricole CIB). He recently spoke with The Boston Consulting Group's Antoine Gourévitch about his lean-driven transformation of the company's IT organization, including challenges to implementation and the invaluable role played by change managers in driving the effort forward.

Can you briefly describe Crédit Agricole CIB's activities?

Crédit Agricole CIB is the corporate- and investment-banking arm of Crédit Agricole Group, one of the world's largest banks by total assets and one with a global presence. We offer clients a range of products and services in capital markets, investment banking, structured finance, corporate banking, and international private banking.

As CIO, you spearheaded an effort to transform Crédit Agricole CIB's IT function. What was your objective in launching this initiative?

The objective was to become a stronger partner to the business. Specifically, we sought to accomplish three things: become closer to our clients by becoming more flexible and reactive, become more efficient from both an operational and a financial point of view, and develop the necessary internal competencies to become a learning entity that would continually perform at a level of excellence. So the overarching goals were greater agility, efficiency, and competence. This encompassed a range of individual ambitions, including optimizing our sourcing mix, proposing more innovative solutions to the business, standardizing our IT methods and better integrating IT developments across the organization, accelerating our project-delivery cycle, and reducing our maintenance costs and operational risks.

How large is Crédit Agricole CIB's IT organization?

We have approximately 2,600 full-time equivalents and an annual budget of €500 million.

When did the transformation kick off, and where are you in the process?

We launched the transformation in 2010 and plan to complete it by the end of 2014. So we're through the bulk of it. In terms of seeing results, we expect to reach our quantitative and qualitative goals in 2014.

PIERRE DULON

Dulon held a variety of positions within the company before assuming his current role in 2009, including head of the company's corporate IT support and IT production services, head of the technology and international systems division within the information systems department, and head of the IT processing division at Calyon. Before joining Crédit Agricole he served as head of group telecommunications at Crédit Lyonnais. He is a graduate of École Polytechnique and Télécom ParisTech.

An interesting aspect of the transformation is that it utilizes lean principles. Lean is typically associated with manufacturing and, to a lesser degree, services—but not IT. Why did you use it here?

We believe that the lean mindset—which is focused on creating value by eliminating waste—is highly relevant to IT management and will become increasingly so as lean matures as a management discipline. Applying lean to IT is certainly different from applying it to manufacturing, however. In IT organizations, the waste is hidden, the "products" are typically unique, and the decision making is relatively advanced. But if lean is applied properly, I believe it can be a very powerful tool for IT improvement. It has ultimately allowed us to make significant reductions to our project cycle times, limit the amount of rework we need to do, and optimize our standards for planning and testing, to note just a few of the benefits we've seen to date.

How did you design the transformation, and how did you apply lean?

We divided the effort into 14 streams and specified six as priorities: global support, test practices, sourcing mix, projects, management rules, and infrastructure optimization. Our initial plan was to utilize a top-down, process-oriented approach. But we met with some difficulties early on. In particular, the rate of adoption of the quantitative and qualitative targets identified by our process experts was below our expectations. We determined that this was due to small gaps between what the experts had designed and recommended, which made perfect sense on paper, and its "real world" value—the operational teams couldn't always see how the new processes would meet their needs and actually improve things. So the uptake suffered and that caused some problems.

To address that, we decided to add a team-oriented, bottom-up element to our top-down approach. A key part of this was the creation of dedicated change managers to support our operational managers. We drew these change managers from our internal ranks and, critically, trained them in lean tools and principles, such as value-stream mapping and force-field analysis, so that they were equipped to identify obstacles to the transformation and determine how to accelerate it from a local operational team's point of view. We assigned a change manager to each of our six IT lines of business.

Did appointing change managers and training them in lean resolve the issues you faced?

Yes, but not right away. We needed to make some adjustments. A critical one was to supplement our change managers' training in lean with training in, literally, change management—the diagnostic, analytical, and cultural levers necessary to change people's behaviors. This would give them the knowledge not only of the "what" but of the "how to." Most of our change managers had backgrounds in project management and were not well versed in change management skills.

We also had to broaden the reach and mandate of the change managers. Initially, we had segmented their efforts on a stream-by-stream basis. But this led to continued thinking in silos and inconsistency in approaches and progress among the different streams within a given IT line. So we had to adjust our change managers' orientation. This delivered some key benefits. For one, we have been able to more readily recognize and replicate the innovations and approaches of the best teams across the organization. Expanding our change managers' reach has also allowed us, for example, to recognize that our efforts to

continually simplify our project-management methodology were counterproductive—the project managers were getting confused because they didn't know which version of the methodology was current. We resolved this by versioning the project management documentation.

So we had some challenges in optimizing our use of change managers. But we resolved them, and these managers have proved a critical link in the transformation process. Their value, and the value of lean tools and principles, has become obvious to everybody.

Where has the value been most visible?

In the way it has empowered and transformed our IT middle managers. The assistance of change managers who are knowledgeable in lean has given our IT middle managers the tools to take ownership of the transformation and make it work. It has also developed our IT middle managers as professionals, helping them make the transition from team leaders and technical experts to genuine managers and coaches. So there has been a longer-term benefit as well that will help them and our IT organization going forward.

With the transformation winding down, what are your next objectives?

The next step for us as an IT organization is to try to ingrain the culture of change and continuous improvement that we have developed through the transformation into our DNA. As part of our efforts to do so, we are planning to develop an internal training academy, similar to what we did previously for our project managers, to train additional change managers—we want to double our current seven—and to reinforce the change management tool kit. Our tar-

get tool kit will leverage a combination of lean, our experience in change management, and Six Sigma methodologies for measurement. The academy will initially be solely for IT, but we have designed it so that it can be shared with operations, with which IT shares many ambitions and constraints. We also think the academy will be a way to attract and retain IT talent.

Based on your experience, what advice would you offer other CIOs who are engaged in or contemplating a transformation effort?

The use of change managers who can deploy lean management principles has been a key to the success of our transformation, and I would recommend that CIOs involved in similar efforts at least consider the idea. Developing change managers can also bring long-term advantages, given that IT organizations are increasingly being called on to transform themselves on an ongoing basis, and the ability to efficiently manage change is thus a necessary requirement. I would also recommend that CIOs utilize a mix of internal personnel, who have a strong understanding of the company, and external resources who bring powerful methodologies and have an outsider's eye. The combination of perspectives and insights proved highly valuable in our case.

Beyond that, I would suggest actively leveraging HR, as it can be a key asset. Measuring progress is also important, as is communicating clearly and regularly on the transformation's status in order to keep people informed and engaged and to counter the skeptics. Finally, for the CIO, demonstrating personal commitment to the effort is vital.

Thanks, Pierre.

THE IVI'S IT CAPABILITY MATURITY FRAMEWORK

TAKING IT IN FINANCIAL INSTITUTIONS TO THE NEXT LEVEL

by Ralf Dreischmeier, Sesh Iyer, and Christina Matzke

SINCE ITS LAUNCH IN 2010, the Innovation Value Institute's (IVI's) IT Capability Maturity Framework (IT-CMF)—an assessment framework designed to help IT organizations maximize their contribution to business value—has been adopted by a range of major industries. High-tech businesses were among the first to enthusiastically embrace the IT-CMF. Pharmaceutical and energy companies followed quickly on their heels.

The latest industry to join the ranks is financial institutions. Growing numbers of industry players have deployed or are deploying the IT-CMF to better understand and improve the performance of critical aspects of their IT, such as knowledge management, benefits assessment and realization, innovation management, and research, development, and engineering. The insights gained are translating into real-world results. And they are convincing IT and business leaders in financial institutions that the IT-CMF could play a valuable ongoing role in their planning and review processes.

A Potent Lever for Managing IT

Growing use of the IT-CMF by financial institutions comes amid challenging times for the industry. A combination of forces—lingering downward pressure on revenues due to the financial crisis, a more stringent regulatory environment, increased competition from traditional and nontraditional players, rising pressure to strengthen the online offering, and the growing importance of big-data capabilities to business analytics and customer recruitment and servicing—are pulling financial institutions in multiple directions at once.

The resulting pressure on these institutions' IT organizations is severe. IT is being called on to boost its own efficiency and reduce its own costs. Simultaneously, it is expected to become more flexible in order to accommodate new regulatory requirements and risk management demands, to enable and/or drive product and service innovation, and to support the development of the online channel. IT organizations are also being tasked with helping their institutions build the capabilities necessary to capture the advantages afforded by optimized customer-data management.

Faced with this daunting to-do list, the industry's IT leaders are thinking about how best to move forward, and an increasing number are turning to the IT-CMF for ideas and insights. The framework—which was developed by the IVI, a global consortium of industry, government, not-for-profit, and academic organizations that aspires to establish a gold standard for managing IT for business value—affords a highly detailed and systematic

look at IT. It covers the full scope of IT's activities, dividing them into 32 critical capabilities and breaking each down into "capability building blocks."[1] (See Exhibit 1.) For every building block, the IT-CMF defines five maturity levels from 1 ("basic") to 5 ("advanced"). Assessing the maturity level of each one can help an IT organization understand its current position, make comparisons with benchmarks and peers, and define a target level that will maximize the business value generated for the company. (For more details on IVI and the IT-CMF, see "Managing IT for Business Value: The New Gold Standard," BCG article, September 2010.)
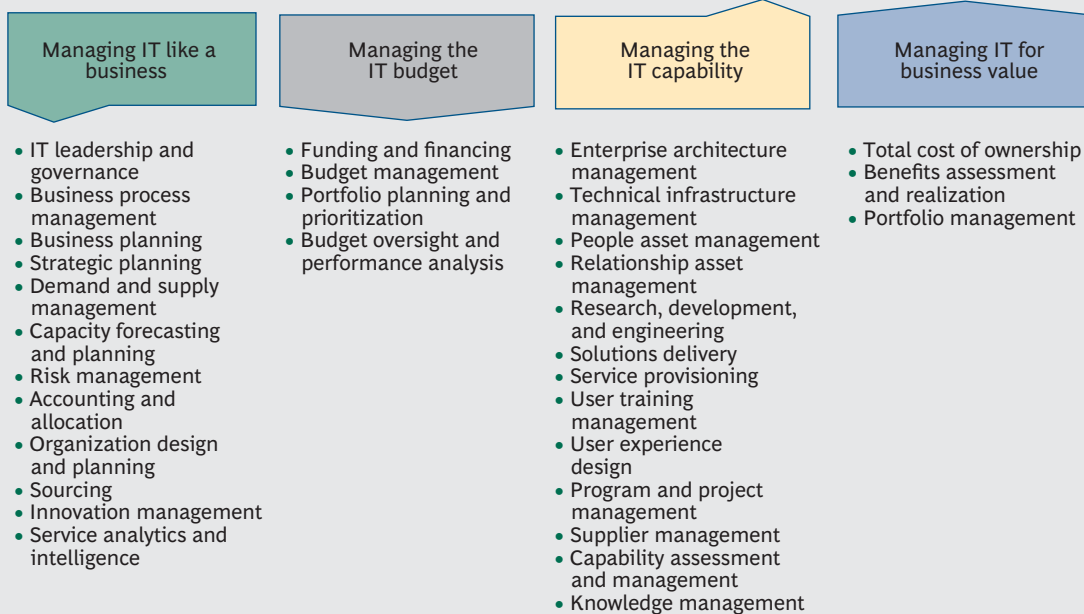
The framework's depth, breadth, degree of rigor, and focus on business value make it particularly helpful for financial institutions in the current climate. The IT-CMF can be used, for example, to drill down on a specific point of weakness—such as knowledge management—and provide a comprehensive diagnosis. It can be used to review a group of IT capabilities related to a particular challenge—such as responding to new regulatory requirements—and provide a baseline for ongoing measurement. It can also be applied to a range of "business as usual" processes, simultaneously and for an extended period, in order to track the progress of a broad transformation program. And it can provide a high-level overview of strengths and weaknesses across the entire IT organization, making it ideal for a new CIO or for one faced with the task of integrating two IT organizations following a merger or an acquisition.

The framework is particularly helpful for financial institutions in the current climate.

The IT-CMF offers financial institutions further advantages. Compared with other diagnostic frameworks, it focuses on capabilities and value delivered to the business rather than on IT processes alone. It is comprehensive, covering all critical IT capabilities, and also easy to deploy in smaller modules, allowing the company to gain insight into hot spots. It identifies and synthesizes best practices among both financial institutions and companies in other industries—the total number of IT-CMF assessments now exceeds 300—offering an insider's perspective on what works, what doesn't, and why. And it identifies practical ideas for how IT can improve its capabilities.

EXHIBIT 1 | The IT Capability Maturity Framework Examines 32 Critical IT Capabilities

Managing IT like a business	Managing the IT budget	Managing the IT capability	Managing IT for business value
• IT leadership and governance • Business process management • Business planning • Strategic planning • Demand and supply management • Capacity forecasting and planning • Risk management • Accounting and allocation • Organization design and planning • Sourcing • Innovation management • Service analytics and intelligence	• Funding and financing • Budget management • Portfolio planning and prioritization • Budget oversight and performance analysis	• Enterprise architecture management • Technical infrastructure management • People asset management • Relationship asset management • Research, development, and engineering • Solutions delivery • Service provisioning • User training management • User experience design • Program and project management • Supplier management • Capability assessment and management • Knowledge management	• Total cost of ownership • Benefits assessment and realization • Portfolio management

Source: Innovation Value Institute.

The framework is also user friendly to both IT and business audiences, in contrast to other, more technical and process-oriented frameworks. And it can spark meaningful discussions between the business and IT—which often hold very different views—on current IT maturity levels, targets, priorities, and suggestions about how to achieve those targets.

Where Financial Institutions Stand Today

How do financial institutions rate their IT capabilities? Data from more than 50 IT-CMF executive assessments indicate that the profile of these institutions is similar to that of companies in other industries in terms of identified strengths and weaknesses. But financial institutions give themselves higher scores overall, with the differential particularly large in portfolio management, demand and supply management, accounting and allocation, budget management, and service analytics and intelligence. (See Exhibit 2.)

This relatively strong self-assessment accurately reflects the IT-intensive nature of financial institutions—above-average maturity in most critical capabilities is essentially a given and a prerequisite for competitiveness.
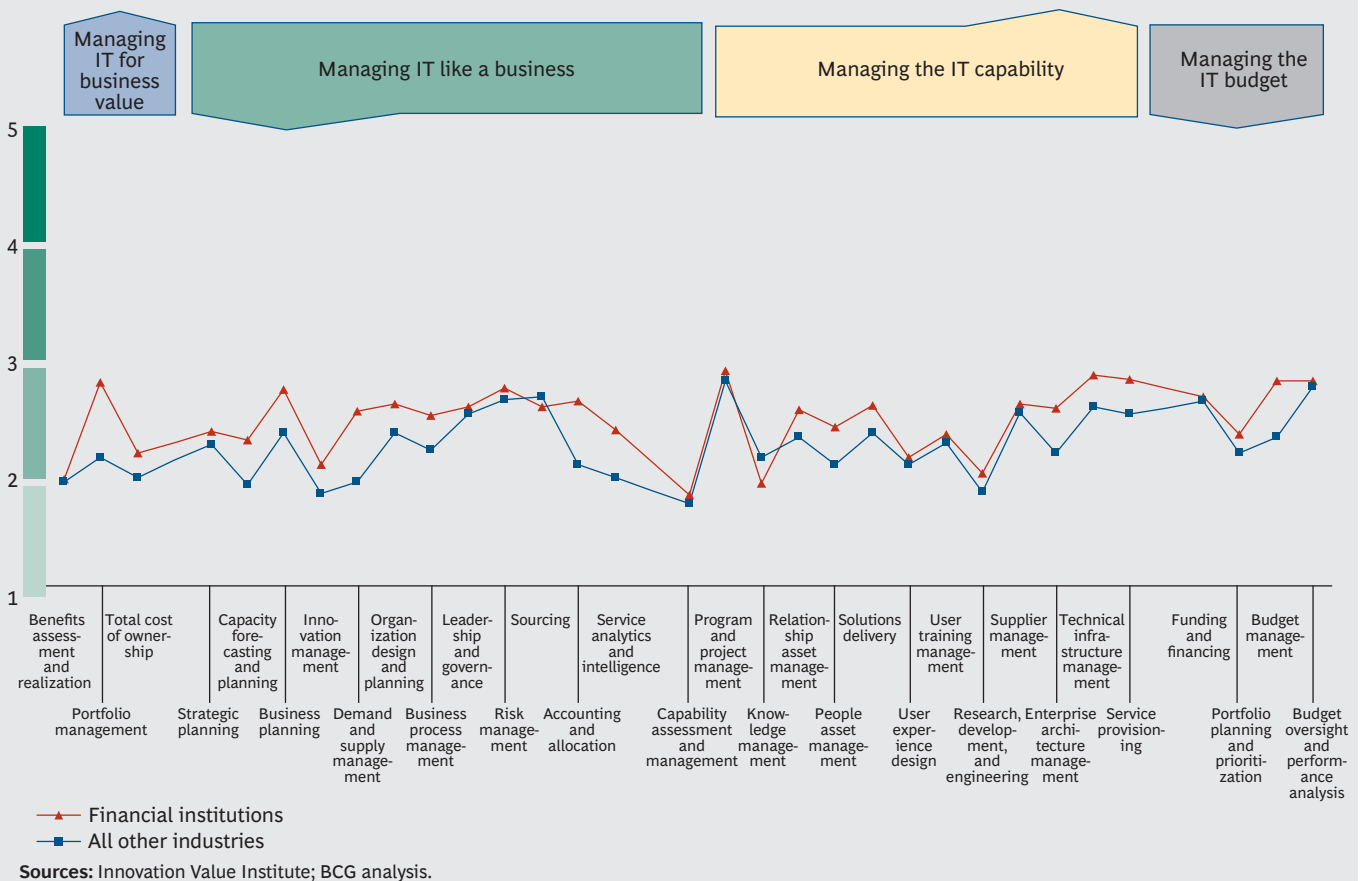
In absolute terms, financial institutions that have participated in IVI assessments rate themselves strongest in the following capabilities:

- Program and project management

- Portfolio management

- Technical-infrastructure management

- Risk management

- Budget oversight and performance analysis

- Budget management

- Service provisioning

EXHIBIT 2 | Assessed IT Maturity at Financial Institutions Is Relatively High

Sources: Innovation Value Institute; BCG analysis.

The average maturity level for these capabilities ranges from 2.7 to 2.8. Worth noting are the self-assessments for risk management and for budget oversight and performance analysis. While financial institutions identified these two capabilities as strengths, the gap between their scores and the average scores received by the same capabilities in other industries was relatively narrow. This might seem surprising, given the fundamental role that these capabilities play in any financial institution's business, especially in the current environment.

At the other end of the spectrum, financial institutions consider themselves weakest in the cluster of capabilities supporting IT-enabled business innovation:

- Knowledge management

- Research, development, and engineering

- Innovation management

- Capability assessment and management

- Benefits assessment and realization

These capabilities received an average maturity score of 2 or lower. Given the increasing importance of the online channel to financial institutions' business model and the channel's propensity to reward innovation, these scores can be expected to rise over time as these companies make innovation an ever-higher priority.

Driving Business Value with the IT-CMF: Three Examples

Financial institutions are using the framework in different ways to address both short- and longer-term challenges. And they are reaping a range of benefits.

Tackling the Root Causes of Rising Complexity and Process Inefficiency. One global company deployed the IT-CMF in its efforts to halt rising IT complexity and process inefficiency. These problems had significantly driven up the institution's IT costs. They had also caused delays in the implementation of major systems- and business-transformation programs,

compromising the IT organization's ability to support the company's efforts to accelerate growth through strategic partnerships.

Financial institutions rate themselves weakest in IT-enabled business innovation.

As a first step, the company undertook an executive (that is, a high-level) assessment of all its IT operations. This assessment identified gaps in key capabilities—namely in portfolio management, program and project management, relationship asset management, and solutions delivery. The institution then conducted a more detailed IT-CMF assessment that drilled down on these capabilities, and it validated the assessment's findings with IT and business stakeholders.

A number of major problems surfaced during this more granular assessment. There was limited transparency into the IT organization's management of resources and demand, coupled with a lack of clarity in roles and accountability. There was also a cultural bias against standardization and the adoption of formal processes. And there were "leaks" at numerous handoff points in the solutions delivery process—for example, in the communication of business requirements between business analysts and technical and quality-assurance teams—that were driving up costs and leading to frustration.

These IT-CMF analyses served as a basis for solid recommendations on how to address the identified problems. Among them were suggestions for speeding up the development process and significantly improving software quality by improving quality assurance processes and test automation; achieving better alignment between relationship managers and systems delivery personnel; and establishing new resource-management processes to make better use of the shared resource pool. The IT organization agreed with the recommendations and developed an action plan. The plan established multiyear implementation programs—including quick wins in cost

and complexity reduction through applications and infrastructure rationalization—and assigned owners to each program and critical activity. These measures are expected to translate into a range of benefits, including strengthened relationships with key business partners and an overall savings of 10 to 15 percent per year.

Making a Step Change in Technical-Infrastructure Management.

Financial institutions are also using the IT-CMF to do "deep dive" analyses of individual capabilities. One European financial institution leveraged the framework to better understand and improve its technical-infrastructure management (TIM). An assessment found that the maturity level of the company's overall TIM capability was in the basic-to-intermediate range. But it also identified a number of key weaknesses in the individual building blocks of this capability, including storage management and asset management, as well as weaknesses in specific life-cycle-management activities, particularly decommissioning. Finally, the assessment revealed some instances of misalignment between the current or targeted maturity level of individual building blocks and the relevance of those building blocks to the company's objectives.

On the basis of these insights, the institution was able to develop a TIM plan focused on those opportunities with the greatest business-value potential. The plan specified near-, medium-, and long-term initiatives and reflected the constraints on resources imposed by the economic downturn. Implementation of the plan has netted the company several million dollars in savings.

Embarking on a Multiyear IT Transformation.

Financial institutions are also finding that IT-CMF assessments, by providing fresh insights into longstanding issues and an implementable path forward, can rejuvenate a company. The IT organization of a major retail bank in Asia, for example, used the IT-CMF to identify shortcomings in key IT capabilities and to improve its own ability to support the business.

A rapid, focused IT-CMF assessment identified weaknesses in several critical capabilities—such as IT budget management, service provisioning, and program and project management—and provided the basis for a three-year plan for righting the ship. The assessment also identified opportunities for several quick wins that could lock in value early and with limited effort, such as establishing a transparent IT-cost baseline that utilizes a consistent IT taxonomy and applying an optimized portfolio-prioritization approach to the bank's strategic-planning process.

The effort is now under way and progress is clearly being made, supported by clear milestones and follow-up IT-CMF assessments every 6 to 12 months. Most important, the company's senior IT management has been energized by the results to date and is committed to driving the effort forward.

F INANCIAL institutions face a host of challenges in the current environment. Robust IT capabilities can be a powerful lever in negotiating those challenges—and the IT-CMF can be a uniquely effective aid in helping IT organizations optimize the necessary capabilities. CIOs of financial institutions (as well as those in other industries) who have yet to explore the framework and are interested in learning more about it can contact the authors or visit the Innovation Value Institute's website at http://ivi.nuim.ie/.

NOTE
1. The IVI is introducing an additional capability, "sustainable information and communication technology," which will push the total number of critical capabilities to 33.

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CIOS AND CLOUD COMPUTING

A RELATIONSHIP REVISITED

by David Dean, Tamim Saleh, and Jon Brock

FOR CHIEF INFORMATION OFFICERS, cloud computing is no longer a question of *if.* Rather, the focus now is on where and *how* to deploy it.

This key message emerged from a recent Boston Consulting Group survey of CIOs at larger companies. CIOs, this latest survey revealed, have moved well past the dip-a-toe stage with regard to the cloud. (For a discussion of findings from our first survey, see "Cloud Computing in Large Enterprises: Questions for the C-Suite," BCG article, September 2010.) They consider it a potent tool that can deliver benefits extending far beyond cost reduction. And CIOs are applying cloud services increasingly aggressively, although they do not consider the cloud a panacea. They believe it must be applied selectively—and managed closely.

CIOs Are Embracing the Cloud

After a lengthy wait-and-see period, CIOs are turning to cloud computing in large numbers, lured by the potential for better, faster, and cheaper IT. And the momentum continues to build. Virtually all the CIOs we polled have by now deployed some form of cloud services, using either their own or third-party resources. And roughly a quarter of their current IT capital spending is directed at some sort of cloud technology.
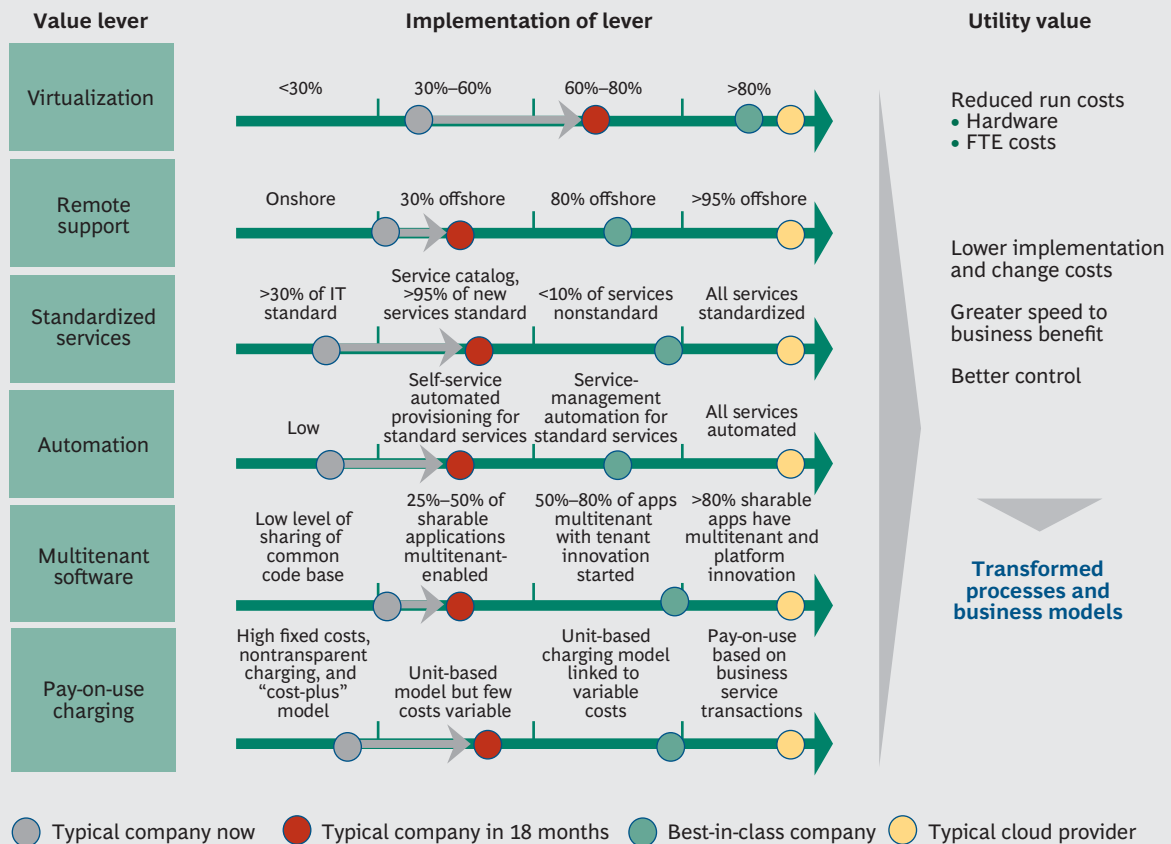
Key Objectives. Driving this strong adoption is the fact that the cloud, through such levers

as greater standardization and automation, enables CIOs to capture advantages that can be hard to achieve through conventional, in-house IT capabilities. (See Exhibit 1.) The potential for significant savings remains, of course, a major attraction. The CIO of a national postal service described the possible drop in costs as "so significant you can't ignore it" and marveled at the gains his organization had achieved: "We expanded cloud services into 17 countries in less than six months and saw a 2.5-fold reduction in IT implementation costs."

But CIOs' reasons for embracing the cloud now extend well beyond cost reduction. Speed—measured, for example, in time to business benefit—is a particular aim. Indeed, 70 percent of the CIOs we interviewed said the potential speed benefits were of high or critical importance in their decision to utilize cloud services. The CIO of a mobile handset company said that, by moving to a cloud provider, "we reduced our provisioning time [for servers] from 37 days to a few minutes."

Focus Areas. CIOs see particular value in applying cloud services to such "commodity-like" functions as e-mail, procurement, and aspects of sales management. For such functions, where there is little business value to be gained by customization and the focus instead is on providing good-enough levels of

Exhibit 1 | Cloud Services Can Deliver Value Hard to Achieve via Conventional, In-House IT Capabilities

Value lever	Implementation of lever				Utility value
Virtualization	<30%	30%–60%	60%–80%	>80%	Reduced run costs • Hardware • FTE costs
Remote support	Onshore	30% offshore	80% offshore	>95% offshore	Lower implementation and change costs
Standardized services	>30% of IT standard	Service catalog, >95% of new services standard	<10% of services nonstandard	All services standardized	Greater speed to business benefit
Automation	Low	Self-service automated provisioning for standard services	Service-management automation for standard services	All services automated	Better control
Multitenant software	Low level of sharing of common code base	25%–50% of sharable applications multitenant-enabled	50%–80% of apps multitenant with tenant innovation started	>80% sharable apps have multitenant and platform innovation	**Transformed processes and business models**
Pay-on-use charging	High fixed costs, nontransparent charging, and "cost-plus" model	Unit-based model but few costs variable	Unit-based charging model linked to variable costs	Pay-on-use based on business service transactions	

⬤ Typical company now ⬤ Typical company in 18 months ⬤ Best-in-class company ⬤ Typical cloud provider

Source: BCG CIO/CTO interviews, 2011.

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service while containing costs, cloud services can prove ideal indeed.

In particular, application of cloud-based software to such functions offers a host of advantages, including faster implementation and time to benefit, lower installation and change costs, fewer skills needed in-house, and greater ease in updating software. Use of such software also enforces standardization across the company, preventing unnecessary customization of functions and processes. And it can free IT management to focus on higher-value activities.

CIOs are increasingly looking to expand the range of commodity-like functions they target with the cloud, our survey revealed. They view specific core-data applications, such as enterprise-resource-planning and billing systems, as potential candidates. They also see major opportunities in data center services, particularly in testing and development,

which can account for more than half of data center costs. Indeed, CIOs expect that more than 60 percent of data center services will employ cloud technologies within three years. Whether that expectation is ultimately met will depend largely on how well cloud providers can address their key challenges, which include a shortage of necessary internal technical skills and capabilities, difficulty helping clients integrate legacy applications, pressure from clients to customize their offering, and lack of familiarity or comfort with the contracts and service-level agreements clients demand.

We believe a combination of factors will encourage CIOs to continue to target higher-value-added areas with cloud services. Changing expectations from customers and the growing reach of digital technologies are putting a premium on IT agility and speed—and cloud technologies can serve as critical components of the platforms that enable these capabili-

ties. Non-IT executives' growing awareness of the cloud's potential to create business value—for example, by increasing speed to market and facilitating entry into new markets—will also push CIOs in the direction of greater, more high-value use of cloud services.

CIOs See Limits, However

Although CIOs view the cloud as a powerful tool, they do not consider it the answer to all problems. They note the barriers it must overcome before it can live up to its potential. And some CIOs, especially those whose companies have sufficiently large-scale IT operations, are deciding that building in-house cloud capabilities makes more sense than buying capacity from a cloud provider.

Hurdles to Adoption. Among the significant remaining obstacles to widespread cloud adoption is the regulatory environment, especially rules regarding the location of data. "Finance and legal services lag behind the technology," said the CIO of a mobile communications manufacturer. "Contracts cannot cope; vendors struggle, too. Anything beyond basic services is beyond the maturity of both demand and supply." CIOs also note the challenges of latency issues and what to do with legacy systems.

Another recurring complaint from some business stakeholders is the lack of cloud customization options, despite the recognition that the one-size-fits-all aspect of cloud offerings is a key reason for the speed and cost savings they deliver. This tradeoff can be too big for some companies, however. "Why align with a cloud provider if it means you lose your competitive advantage?" asked the CIO of a financial services company.

Concerns About Public Offerings. Most CIOs of large companies remain skeptical about the availability of robust public-cloud offerings. They worry especially about security, data backup, and disaster recovery. As a result, most are adopting private clouds. (See the sidebar, "Terms Defined.") As another CIO of a mobile telecommunications manufacturer said, "You need the guarantee of a level of service management that, at the moment, is not there."

CIOs also have concerns about pricing, noting that the hidden costs of public-cloud services can grow quite high with heavy use. "Current public-cloud offerings are still too expensive for large companies," said the CIO of a Japanese company. "At present, only startup companies would see substantial benefit."

TERMS DEFINED

This article refers to two types of clouds:

- *Public clouds* are computing services made available to the general public over public networks, including the Internet.

- *Private clouds* are computing services accessed over a dedicated network operated solely for a particular organization. These services may be operated by either the organization itself or a third party.

Several varieties of cloud services are available, including the following:

- *Software as a service* is the provision of an application offered over a network.

Users are not required to install and run the application on their own computers.

- *Infrastructure as a service* is the availability of storage, processing, and network capacity billed on the basis of consumption.

- *Platform as a service* refers to a development environment and associated tools and services offered to customers for building their own applications.

- *Process as a service* is the full provisioning of a process, such as accounts-receivable collection, in the cloud.

Going It Alone. Many companies with large-scale IT operations have achieved efficiencies through internal deployment of cloud technologies, negating the appeal of external cloud sourcing. Another CIO of a financial services company told us, "We have such scale that we can implement cloud at lower cost internally—and we don't charge a profit."

Other companies believe the cloud offering falls short of their requirements. "We have a highly optimized internal infrastructure," said an automaker CIO, "and the outside proposition is not adequate for our needs."

Keys to Cloud Success Tomorrow—BCG's View

As CIOs increasingly test the limits of the cloud, they likely will need to rethink aspects of how they manage it. In particular, we recommend that, as they plan their next wave of investments, they consider dividing the range of scenarios in which the cloud can add value into four categories—what we term commodity IT, agile IT, scale IT, and growth IT. Each has its own characteristics and demands and will respond best to different cloud strategies, technologies, and services. (See Exhibit 2.)

- *Commodity IT* includes nondifferentiating services, where the demands change little over time and the goal is adequate service at low cost. Here the focus of cloud deployment should be software as a service, process as a service, and infrastructure as a service, with the ultimate objective of driving down the organization's costs by enforcing standardization.

- *Agile IT* can include digital channels and business-to-business services. These are potentially highly differentiating areas where the demands can change rapidly and there is a premium on speed. Here the emphasis should be on building agile development and testing platforms.

- *Scale IT* refers to situations where IT has sufficient scale or requires especially high performance. Examples include large-scale core-banking platforms and situations where internal computing resources are provided as external services. Typically, these are differentiating areas with high performance demands and large but stable volumes.

- *Growth IT* includes R&D and the capabilities necessary to support new products. Here the demand and requirements are

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EXHIBIT 2 | Cloud Strategy Should Vary by IT-Service Type

	Commodity IT	Agile IT	Scale IT	Growth IT
Characteristics	Low level of change	High level of change	High, stable volumes	Uncertain demand
	Nondifferentiating	Differentiating	Differentiating	Uncertain requirements
	Available in cloud	Need for speed	High performance	Scalability
Examples	Procurement	Electronic channels	Large core-banking platforms	R&D
	E-mail	Business process management	Quantitative modeling and analytics	New markets and propositions
	HR	Business-to-business services		
	Billing			
Strategy	SaaS, PaaS, and IaaS sourcing to drive standardization	Build agile IT platforms with IaaS and PaaS	Build internal cloud (or source based on cost/benefit)	Maximize cloud sourcing for variable costs

Source: BCG analysis.
Note: SaaS = software as a service; PaaS = process as a service; IaaS = infrastructure as a service.

uncertain and there is a need for scalability. The emphasis should be on maximizing cloud utilization to optimize the ratio of variable costs to fixed costs.

In addition to viewing cloud deployment through this lens, CIOs will need to pay increasing attention to skills and capabilities within their own organizations to ensure that they can leverage all that the cloud offers. Demand management skills, in particular, will be an essential element. Indeed, some companies, given variable internal demand for IT services and the pay-as-you-go nature of cloud computing, could find their IT costs actually rising after a major move to the cloud if they neglect to manage demand actively.

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Clearly cloud computing has reached—perhaps even passed—an inflection point.

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Other capabilities—especially service integration, supplier management, and strategic data management—will need enhancements as cloud adoption increases and the IT organization's focus shifts away from the direct provision of services. CIOs must manage this. They also have to manage the cultural changes within both the IT organization and the business that the cloud's growing role brings. "The biggest mindset shift for IT," said an energy company CIO, "is to get used to the idea that you can manage systems that are secure and are not on your own infrastructure."

CLOUD COMPUTING IS reshaping business and IT practices—and CIOs are increasingly leading the charge. Indeed, we detect a significant shift in attitude from what we saw in our last survey two years ago. CIOs are thinking in increasingly bold terms about the cloud, trying to map out their next wave of investments and determine the implications for their organizations. And they are beginning to negotiate the inevitable hurdles. As the CIO of a wireless-communications company told us, "I am convinced that our vision of cloud is right, but I need to articulate the business value more clearly to senior executives. The cloud has huge implications for our business." Clearly cloud computing has reached—perhaps even passed—an inflection point in the minds of some of its once-toughest critics.

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INFORMATION STRATEGY FOR VALUE-BASED HEALTH CARE

by Simon Kennedy; Stefan Larsson, MD; and Peter Lawyer

I N AN EFFORT TO curtail escalating costs, growing numbers of health care policymakers, payers, and providers around the world are embracing value-based health care, an approach that focuses on optimizing the relationship between treatment costs and outcomes. The trend is already bearing fruit, with a number of health care systems and organizations using value-based approaches to raise the quality of care while significantly driving down costs.

Translating concept into practice, however, can be challenging. Generally, the biggest hurdle is obtaining the necessary data, which must be in the right format and of sufficient quality for decision makers to discern critical relationships between investment and results. (The desire for high-quality data extends to consumers as well; according to a recent BCG survey of 9,000 consumers in nine countries, a majority of consumers feel that they lack the data on health outcomes necessary to make informed decisions when choosing health care providers.[1]) But securing such data can be problematic. Many companies struggle not only to determine precisely what data they need to meet their objectives but also how best to get it. Far too often, data are fragmented, insufficiently validated, inaccessible, difficult to work with, or otherwise inadequate.

Faced with this quandary, health care organizations frequently resort to the "big data"

approach—gathering and crunching enormous volumes of information—in the hope that useful findings will eventually come to light. But because of the nature of the challenges these organizations face and the inherent complexity of health care data, such overly broad, scattershot efforts rarely work.

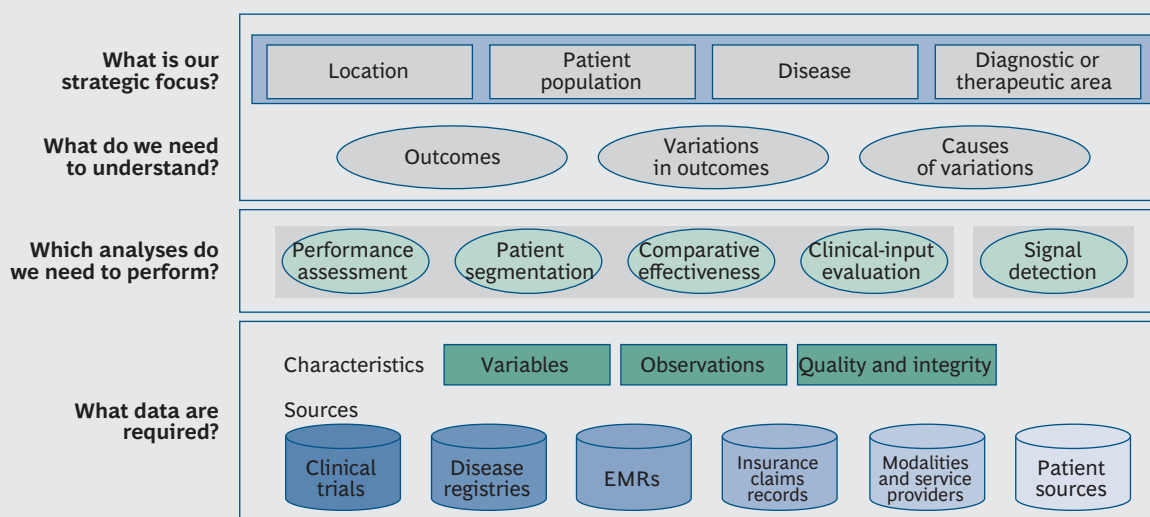Organizations frequently resort to a "big data" approach, but such efforts rarely work.

We believe that the answer lies instead in taking a disciplined, strategic approach to data selection and collection.

Asking the Right Questions

Essentially, an information strategy to support value-based health care must do two things: determine the specific business problem to be solved and identify the analysis and data needed to solve it. An organization can best achieve these goals by answering a series of strategic and tactical questions. (See Exhibit 1.)

What is our strategic focus? Is the organization focused on a specific location, patient

EXHIBIT 1 | Developing an Effective Information Strategy Demands Asking the Right Questions

What is our strategic focus?	Location	Patient population	Disease	Diagnostic or therapeutic area

What do we need to understand?	Outcomes	Variations in outcomes	Causes of variations

Which analyses do we need to perform?	Performance assessment	Patient segmentation	Comparative effectiveness	Clinical-input evaluation	Signal detection

What data are required?

Characteristics: Variables | Observations | Quality and integrity

Sources: Clinical trials | Disease registries | EMRs | Insurance claims records | Modalities and service providers | Patient sources

Source: BCG analysis.

population, disease, or diagnostic or therapeutic area? For example, Kaiser Permanente, an integrated U.S. managed-care provider, has devoted considerable effort to optimizing outcomes associated with medical implantation, since that type of surgery is an important component of the company's portfolio. (See the sidebar, "Kaiser Permanente's Implant Registries.") A global pharmaceutical company, by contrast, might focus on improving patient outcomes for users of a particular drug within a specific population.

What do we need to understand? Once a strategic focus has been determined, the organization must identify the patient outcomes it most needs to understand. Key questions include the following:

- *Which clinical measures provide hard evidence of patient outcomes?* What measures are critical for particular diseases, diagnostics, therapeutics, and patient populations?

- *How do these clinical outcomes vary?* Do they differ by location, patient population, or provider? Which variations are most important to understand?

- *What causes the variations?* Are the variations driven, for example, by differences in diagnostic or therapeutic approaches, clinical processes, or execution?

Which analyses do we need to perform? Gaining a thorough understanding of the most relevant outcomes requires several types of analysis:

- *Performance assessment* identifies variations in outcomes among clinical centers. This benchmarking can serve as the starting point for performance improvement initiatives. Identifying outliers, in particular, can help managers reduce or eliminate poor clinical practices in favor of best practices. Performance assessment can also be used to enable outcomes-based contracting.

- *Patient segmentation analysis* determines whether a given variation in outcome can be explained by differences in patient populations (caused, say, by different environmental factors or different demographic or genetic characteristics). For example, such an analysis might reveal that a particular drug is more effective in specific subpopulations, thus helping the drug's manufacturer improve patient outcomes through better targeting. Patient segmentation analysis is also critical in making the proper risk adjustments to ensure that variation in the patient mix is accounted for in complementary analyses.

- *Comparative-effectiveness analyses* compare the effects of different diagnostic or

therapeutic approaches. Cost effectiveness analysis, for instance, assesses the clinical outcomes of different approaches relative to their cost. Comparative-effectiveness analyses provide information that can be used for a range of purposes, such as designing clinical decision-making tools or in formulary and protocol development.

- *Clinical-input evaluation* explains how different clinical processes, applied to the same protocol in similar patient popula-

tions, can produce different outcomes. Such analysis could, for example, identify a specific provider that is particularly good at encouraging patient adherence to drug regimens, thereby increasing the regimens' effectiveness.

- *Signal detection analysis* reveals potentially significant correlations between inputs and outcomes. It can identify, early on, both adverse and desirable outcomes that may stem from different clinical inputs or

KAISER PERMANENTE'S IMPLANT REGISTRIES

Implantation of medical devices, such as artificial joints and pacemakers, has become increasingly prevalent in the U.S. and is expected to surge in the years ahead. While these devices and procedures can deliver tangible benefits, they can also bring risks, outsized costs, and uncertainty. Many of the new, increasingly technical (and expensive) devices coming onto the market, for example, are introduced with little or no evidence of improved clinical effectiveness. New surgical techniques can also fail to deliver. And for any given procedure, some patient cohorts will be at greater risk of suboptimal outcomes than others.

In an effort to manage the impact of these challenges on its business and members, U.S. managed-care provider Kaiser Permanente (KP) has developed a series of orthopedic and cardiac registries.[1] (Perhaps the best known is the Kaiser Permanente National Total Joint Replacement Registry, which was launched in 2001. The largest registry of its kind in the U.S., it houses data on more than 75,000 knee replacements and 43,000 hip replacements through 2010.) These registries track the incidence, outcomes, and comparative effectiveness of devices and procedures utilized within KP's system.

A key feature of the registries is the depth and breadth of the data employed. Surgical data are supplemented by information on patients (including demographics and medical histories) drawn from the com-

pany's administrative databases and extensive electronic medical records system. This wealth of data helps KP discern patterns and cause-and-effect relationships that might otherwise remain undetected.

The registries have delivered on multiple levels. KP has gained insights that have allowed it to produce better results for patients, including less postoperative pain, fewer infections, and a reduced need for follow-up procedures. The company is also better able to quickly identify patients at risk of poor clinical outcomes. In addition, the registries have allowed KP to notify patients about product advisories or recalls 19 times since 2008. Finally, they have helped KP target its quality-improvement and research efforts and materially lower its related costs for implant surgeries.

KP has advanced the industry's general body of knowledge by sharing its registry data externally. The data have been used in a range of research studies and enabled international comparisons with countries such as Sweden, Norway, Australia, and others that have established similar registries.

NOTE
1. See "The Kaiser Permanente Joint Registries: Effect on Patient Safety, Quality Improvement, Cost Effectiveness, and Research Opportunities," *The Permanente Journal,* Spring 2012, Vol. 16, No. 2.

previously unknown variations in patient populations. Working to understand these outcomes and relationships can improve clinical results.

What data are required? Since each of the analyses described above requires different types of data, determining the specific data characteristics necessary for addressing the problem at hand is essential. Health care organizations should focus on three dimensions of the data that they are considering: the definition of variables, the number and nature of observations, and the data's quality and integrity. (See Exhibit 2.) The relative importance of each dimension will vary depending on the organization's strategic focus and the type of analysis it needs to conduct.

The type of analysis chosen will inform the data requirements.

An organization focused on a particular therapeutic area, for example, would be guided by the unique data requirements of the relevant disease. Chief among the organization's considerations would be the following:

- *The Disease's Duration.* The data set for a chronic disease would necessarily include more longitudinal information than would the data set for an acute disease.

- *The Characteristics of the Therapies Used to Treat the Disease.* Greater therapy diversity or smaller differences among outcomes will increase the data and analytical requirements. In addition, the rate of therapy evolution will affect the value of, and necessity for, historical data.

- *The Setting in Which Care Is Provided.* This will affect the quality and uniformity of the data. Is the disease treated in a specialty facility or a multispecialty environment? Is it treated primarily in academic medical centers or in a range of clinical-care settings?

- *The Size and Homogeneity of the Patient Population at Risk.* The difficulty in obtaining an adequate sample size is amplified for rare diseases whose outcomes vary by patient population.

The type of analysis chosen will also inform the data requirements. A performance assessment to identify relevant variations across providers, for example, requires an adequate sample size for each provider and specific, well-structured outcomes measures. It may also require risk adjustment data to correct for differences in factors such as population age. A clinical-input evaluation conducted to encourage continuous performance improvement requires a different set of characteris-

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EXHIBIT 2 | Health Care Organizations Should Focus on Three Dimensions of Data

Variables	Observations	Quality and integrity
Measures	**Population or sample**	**Process**
• Outcomes	• Number of patients	• Intent
• Relevant input	• Penetration	• Validation
• Financial	• Number of records	• Fidelity
• Patient-centered	• Skew or generalizability	• Timeliness
	• Comparability	
Completeness		**Technical**
• Number of variables	**Time and setting**	• Structure
• Granularity of variables	• Longevity	• Coding
	• Temporal consistency	• Linkability
Context	• Longitudinality across	
• Risk-adjustment data	care settings	
• Patient ID		

Source: BCG analysis.

tics, including input or process measures, historical data for establishing a baseline, and data that can be collected on a timely basis to provide regular feedback and identify inputs or processes associated with better outcomes.

Failure to gain sufficient clinician buy-in can severely compromise an effort.

The bottom line is that there is no single, perfect data set suitable for all types of analysis. And no amount of computational power can make up for incomplete or incorrect data.

When building any data set designed to implement value-based health care, organizations should make sure to include the following:

- Outcomes measures, selected and supported by the relevant clinical-specialist groups, that will spur clinical improvement and innovation

- Input or process measures that can be linked to outcomes to help identify new outcomes-improvement levers

- An adequate sample size with sufficient penetration (defined as the percentage of patients in a given patient population represented in the data set) to ensure that the sample is representative and will reveal patient subpopulations with different response patterns

- Longitudinal data across care settings for tracking outcomes over time

- Standardization, including both standardized definitions and standardized structure and coding

Data can come from a variety of sources, such as clinical trials, disease registries, electronic medical records (EMRs), and insurance-claims data sets. Each source has its strengths and weaknesses. Clinical trials, for example, represent the gold standard for quality. But they are often limited in sample size, duration,

and the number of variables tracked, and their findings may not be generalizable to more diverse populations. Disease registries track data over extended periods but are few in number, and there are often lags in data entry. EMRs collect data in real time, but often the data captured are not standardized. Insurance-claims data sets have a large sample size but do not track outcomes. When choosing among the various sources, let the characteristics of the data guide the way.

A Critical Factor: Clinician Buy-In

Addressing these four questions can help lay the foundation for an effective information strategy. But to succeed, health care organizations must also gain buy-in from clinicians, who have a unique vantage point and role in the value delivery process. Winning organizations will engage clinicians on multiple levels, from defining metrics and analytical methodology to collecting data and interpreting findings.

Failure to gain sufficient clinician buy-in can severely compromise an effort. Consider the U.S. Health Care Financing Administration's initial attempt to disseminate data on hospital mortality rates, for example. From the clinicians' perspective, the effort was problematic because it relied on claims data rather than clinical data and had numerous methodological flaws.[2] Feeling that they lacked a voice in key decisions, clinicians viewed the initiative as something imposed upon them rather than created by them. The project was ultimately terminated.

The results were dramatically different when the U.S. Society of Thoracic Surgeons launched a database to track cardiac-surgery outcomes. The database was conceived by a small group of surgeons who determined the outcomes to track, the mechanisms for data collection, and the methodology for analysis and reporting. But over time, the effort gained increasingly broad buy-in from the clinical community as well as from other key players. (For example, Blue Cross and Blue Shield Association, a U.S. federation of insurers, gave the database a significant boost when it made participation a mandatory requirement for cardiac surgeons seeking inclusion on its list of preferred providers.) The da-

tabase has become a well-established, highly credible entity. It has given rise to more than 100 journal articles that have contributed to the body of knowledge about thoracic surgery and helped improve outcomes.[3]

VALUE-BASED health care could transform the health care industry and the fortunes of many stakeholders. But its success is critically dependent on decision makers having the right information. Health care organizations won't find this information spontaneously or by mindlessly crunching every piece of data they can find. Rather, they will need to develop an optimized information strategy that is based on business needs, proper analysis, and a careful vetting of data and data sources.

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NOTES

1. See "Consumers Seek Hard Data on Health Care Outcomes," BCG article, forthcoming.

2. David M. Shahian et al., "Public Reporting of Cardiac Surgery Performance: Part 1—History, Rationale, Consequences," *Annals of Thoracic Surgery,* September 2011, 92, pp. S2–S11.

3. Manuel Caceres, Rebecca L. Braud, and Harvey Edward Garrett, Jr., "A Short History of the Society of Thoracic Surgeons' National Cardiac Database: Perceptions of a Practicing Surgeon," *Annals of Thoracic Surgery,* January 2010, 89, pp. 332–339.

BEYOND OPEN DATA

MAXIMIZING THE VALUE OF GOVERNMENT DATA

by Adrian Brown

A S TECHNOLOGY ADVANCES, OUR capacity to collect, share, and manipulate data is growing exponentially. In the private sector, many organizations are developing innovative ways to use data to transform their business models and unlock significant new sources of value. From conducting more sophisticated customer segmentation to overhauling recruitment, an organization's ability to exploit data is becoming a critical source of competitive advantage.

In the public sector, governments control a large and ever-increasing amount of data about citizens, public services, and the world around us. From individual health records and school league tables to weather maps and economic statistics, the range of government data is diverse and the potential uses of those data are enormous. Like private organizations, governments face the challenge of getting the most out of their data—in this case, for the greater good.

Until recently, government data were for the most part jealously guarded, available only to those with privileged access. But with the advent of the "open data" movement, governments have been subject to mounting public

pressure to freely release more data to citizens and corporations. (See the sidebar, "The Rise of Open Data.") The movement is heralding a shift in governments' relationship with data—from being a gatekeeper, ensuring that data are securely stored, to becoming a steward, safeguarding data for others. Proponents of open data argue that sharing raw public data is the key to unlocking their value. But while this push for transparency and accountability is commendable, it provides no guidance on other pressing issues, such as which data sets governments should collect in the first place or how they should manage sensitive or personal information.

Indeed, the current debate about the public's role in government data threatens to overshadow an equally important issue: how data can be better used by government to improve outcomes. We believe that, instead of focusing solely on whether or not to release data publicly, governments must also ask themselves a more fundamental question: *How can they maximize the value of government data for society?* In some cases, releasing vast data sets may serve this purpose. But in many instances, changes to how governments themselves use

the data are likely to deliver the greatest impact.

To begin with, governments need to adopt a more strategic approach to the way they collect and use data.

A Strategic Approach to Extracting Value from Government Data

By themselves, government data have no inherent value. Their value lies in their application—specifically, how the data can generate insights that will, in turn, inform a decision or action to improve outcomes in society. To extract value from their data, governments need to design a data strategy that includes the following three elements:

- *Identifying sources of value* by understanding what kind of value is created from different forms of data, and whom it will benefit

- *Mapping the value creation process* by describing the steps required to create that value

- *Determining data rights* by agreeing about the parties that will be involved in creating value and the roles they will play

THE RISE OF OPEN DATA

In recent years, a variety of organizations and political movements have emerged with the mandate to improve government accountability by making data more publicly available. Many governments have responded by unleashing oceans of stored data.

In the U.S., the Obama administration has pioneered the development of Data.gov, a central Web portal for government data sets, and is promoting greater transparency throughout federal agencies. The U.K., France, Australia, and New Zealand have also set strong objectives to integrate open data into their governments' technology strategies, and each has launched an open-data portal.

The European Commission recently launched an open-data strategy for Europe, which it expects will deliver an annual €40 billion boost to the EU's economic growth. It is opening its vaults of information to the public for free through a new data portal, and it is backing the effort with €100 million to fund research into improved data-handling technologies.

Among NGOs, the World Bank publishes extensive data and visualization tools focused on health outcomes and systems in developing countries.

Governments should address these elements holistically, aligning them to the common goal of producing better outcomes for society.

Sources of Value. Government data can create value in a variety of ways, but the three main types of value are better public services, improved accountability, and higher economic growth. (See Exhibit 1.) These come about through improvements to systems and processes within an organization, improved interactions with citizens, and improved interactions between organizations. Better public services can be achieved by using data to find efficiencies and enhance collaboration. Improved accountability stems from using data to inform evidence-based decisions and enhance transparency. Higher economic growth can result when insights about industry are used to foster efficiency in the private sector as well as to promote equitable regulation.

Often, a single source of data creates value in multiple ways. For example, publishing surgical outcomes can help clinicians improve their own performance, help patients choose a hospital, and help citizens hold to account those responsible for the health care system.

To find the sources of value within a given portfolio, government agencies should first examine the data sets they already hold, and ask whether or not they are missing any opportunities to use them to create value. This is where open data can sometimes help, because often the quickest way to find new opportunities from existing data sets is simply to make them publicly available and then observe how people make use of the data.

More strategically, government agencies should consider how their organization creates value—in other words, their operating model—to identify opportunities where a smarter approach to data might allow them to create even more value in the future.

The Process of Value Creation. For government data to create value, they must inspire action. The process of creating value from data involves four steps, beginning with collection and ending with action. (See Exhibit 2.) Underpinning each step is a series of enablers such as IT infrastructure and organization structures.

The open-data movement is most interested in influencing the second and third steps in the chain: distribution (who can access data) and analysis (how they can use the data). But governments must concern themselves with activities across the whole

Government agencies should examine the data sets they hold and ask whether they are missing any opportunities to use them to create value.
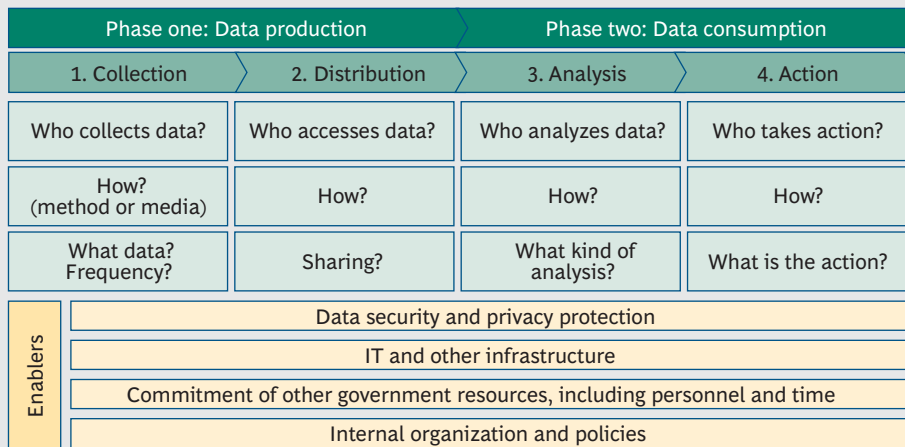
chain so that they can be sure of making informed decisions on the basis of the best available data. This means that government agencies must make decisions at each step of the value chain, from choosing what information to collect to how to distribute it, how best to analyze it, and what actions to initiate as a result of that analysis. While governments need to oversee each step, they do not have to be directly responsible for delivering all the steps. Instead,

EXHIBIT 1 | The Data Value Matrix

		Types of value		
		A Better public services	**B** Improved accountability	**C** Higher economic growth
Sources of value	**1** Improved systems and processes within organizations	Public-sector efficiency	Evidence-based policymaking	Private-sector efficiency
	2 Improved interactions with citizens	Choice, coproduction, and citizen focus	Transparency and open government	Private-sector entrepreneurialism
	3 Improved interactions between organizations	Multiagency collaboration and data sharing	Inspection and audit	Equitable regulation and market efficiency

Source: BCG analysis.

EXHIBIT 2 | The Data Value Chain

Phase one: Data production		Phase two: Data consumption	
1. Collection	2. Distribution	3. Analysis	4. Action
Who collects data?	Who accesses data?	Who analyzes data?	Who takes action?
How? (method or media)	How?	How?	How?
What data? Frequency?	Sharing?	What kind of analysis?	What is the action?

Enablers

Data security and privacy protection
IT and other infrastructure
Commitment of other government resources, including personnel and time
Internal organization and policies

Source: BCG analysis.

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they can draw on the skills of other parties (sometimes known as *infomediaries*) who may play a role across one or more steps—for example, by taking information from a number of sources and presenting it in an easy-to-read format or making it available through an app.

There is no shortage of data being collected and held by government agencies. But the challenge for governments when extracting value from data is to ensure that the data they collect in the first place will ultimately serve the purposes for which they

were intended. To do this, governments need to consider what is required at each step of the data value chain. A promising example of how one government is doing just that is already under way in the U.K.

It is estimated that welfare fraud and error cost U.K. taxpayers £5.2 billion every year, or £165 every second. As well as being expensive, fraud undermines the public's confidence in the welfare system. Better use of government data lies at the heart of a new strategy to reduce fraud and error by 25 percent by 2015.

The new strategy addresses each step on the data value chain.

- *Collection.* To facilitate more accurate, timely detection of fraud and error, data across government agencies will be combined far more quickly and supplemented with data from outside sources (for example, credit reference agencies).

- *Distribution.* Updates to the status or eligibility of individuals within the welfare system will be shared far more rapidly with the relevant

agencies and public bodies. For example, local authorities will automatically be informed about changes to benefits or tax credits.

- *Analysis.* It will be easier to crosscheck databases to highlight possible errors or fraudulent activity. For the first time, agencies will be able to perform these data matches in near real time when an individual files a claim.

- *Action.* The new strategy should not only prevent a significant amount of new fraud and error but also highlight existing problems. A range of actions will ensue, such as using crosschecking to identify claimants suspected of having an undisclosed partner.

rights as assets. Along with those rights comes the responsibility of ensuring that governments account for the often competing interests of different parties. For example, if governments collect data on health outcomes and then license the right to use the data to a limited number of organizations subject to certain restrictions, it may contribute to a private market for health data.

Another hotly contested area is the status and ownership of personal data. The extent to which individuals have rights over data related to them is the subject of debate in many countries around the world. While techniques such as *anonymization* (the removal of personal identifiers) and *aggregation* (reporting data in

- Differentiating between data that are required for compliance or regulatory purposes and data that are better suited to informing policy decisions

- Balancing the rights of individuals to privacy with the benefits of using government data to deliver better outcomes for the broader population

- Guarding against potentially perverse outcomes of making certain data publicly available; for example, while patients might use mortality rates to choose the surgeon they perceive to be the most competent, publicizing those rates could motivate clinicians to reject high-risk patients for fear of damaging their scores

The volume and variety of the data being collected by governments grow ever larger, with profound implications for individuals and society as a whole.

When it designed this strategy, the U.K. government carefully considered the implications and limitations of data sharing both between government organizations and with private organizations. A clear description of the data rights held by each party enables mutually beneficial data sharing and collaboration to take place while addressing questions of personal privacy.

Data Rights. Data rights describe who can do what with data. The allocation of data rights will determine the boundaries of value-creating functions and the competitive dynamics, if any, among players within the data value chain.

In the context of government data, government entities are usually the primary holders of rights, with the authority to trade or transfer those

summarized form) can be used to depersonalize data, they are also likely to reduce the usefulness of the data. Managing these tradeoffs, and allocating rights between governments and individuals, will be key to resolving the status and uses of personal data in the future.

Challenges Within the Government Context

To derive value from the data they hold, governments face some unique challenges:

- The practical difficulties of managing the huge volume of data they oversee, which make it vital for governments to adopt a strategic mindset and prioritize what really matters—in some cases, by ceasing to collect data that do not create value

GIVEN THAT GOVERNMENT agencies operate within a highly complex environment, the most effective approach to change is an adaptive one, in which steps are taken and outcomes observed before further changes are rolled out. Although there are challenges to overcome, some of them substantial, the potential value of government data is too great to overlook. Meanwhile, the volume and variety of the data being collected inevitably grow ever larger, with profound implications for individuals and society as a whole. If governments fail to take a strategic approach to data, now and in the future, they will end up neglecting their duties to their citizens.

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