

Thinking out of the toolbox

How digital technologies are powering the operations revolution

IBM Institute for Business Value

The need for deep change

A new kind of industrial revolution is upon us, as digital technologies redefine business strategy and operational execution. Executives are under pressure to innovate and make smart investments in game-changers like the Internet of Things (IoT), mobility, cloud computing and analytics. Challenges remain, such as talent issues, data security and more. And while some industries are embracing a transformation agenda – redefining core processes and creating new business models for competitive advantage – others are lagging behind. What can executives do to stay at the forefront of the digital operations revolution?

Executive summary

Take a roll call of today's most successful companies, and chances are good that operational innovation is a major driver of their outstanding performance. They are not just doing things better – they are doing things differently. More than ever before, rethinking and remaking fundamental operational activities can give innovators a decisive competitive advantage and even allow them to transform entire industries.

Digital technology is powering this operations revolution. Our global survey of 750 operations executives shows that technological change is a top-of-mind issue. In fact, aside from economic conditions, respondents expect it to be the external force with the highest impact on their companies over the next three years.

This technological impact hits operations from two directions. It creates a major push for operational innovation, as executives find new and better ways of doing things with digital tools. They can then move faster and more efficiently behind the scenes. At the same time, it pulls operations along, as new generations of technology-enabled products and services require support. And with new competitive models remaking industries and blurring traditional sector boundaries, operations innovation and process optimization become even more important.

Michael Hammer once defined operations innovation as “truly deep change” in core activities and processes.¹ He wrote in the *Harvard Business Review* that this entails more than operational improvement or excellence – it necessitates “a departure from familiar norms and requires major changes in how departments conduct their work and relate to one another.”² Over a decade later, in the era of digital operations, such deep change is essential.



COOs named the **Internet of Things** as the **number-one tech trend** influencing business strategy



Surveyed companies' **execution of digital operations strategies and models** has grown **29%** in just two years



Cybersecurity and **lack of available talent** are the top two challenges to digital operations initiatives

Capitalizing on changes of this magnitude takes serious planning. Based on responses to our 2015 Digital Operations Revolution Survey, many companies have at least outlined digital operations strategies, but most have far to go in terms of execution and strategic payoff. In this report, we examine the importance of innovating digital operations across diverse industries in an era of technology-driven disruption, concentrating on three key areas:

- The technologies and strategies required to operate in new ways for a digital era
- The critical importance of cybersecurity
- A lack of focus on talent acquisition and development that threatens progress.

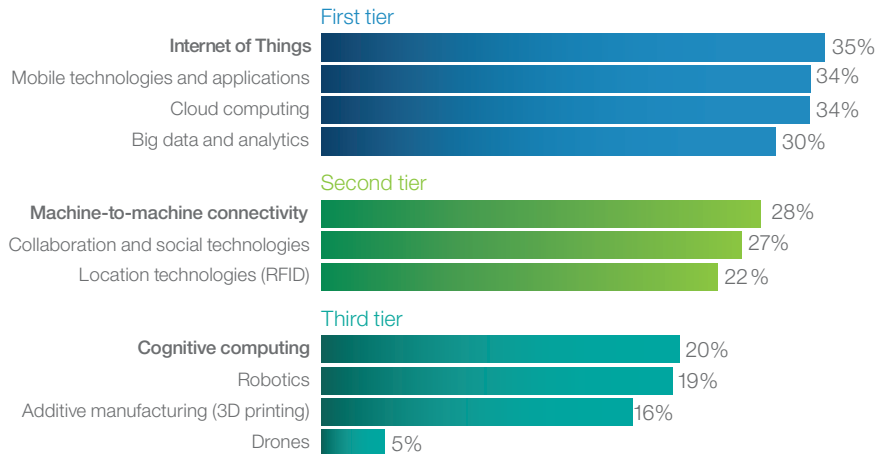
The revolution in digital operations is happening now. Keeping up with the pace of change is all the more essential because fresh influxes of technology will continue to remake operations. Companies that do not make the necessary investments and process changes are in danger of being left behind.

Digital transformation demands a new operations strategy

The most crucial tools needed to achieve business goals include the building blocks of modern IT – mobile technologies and applications, and the cloud – along with the new essentials, like IoT and analytics (see Figure 1). Here the pull of the marketplace on operations is apparent. Both IoT and advanced analytics incorporate customer-facing applications – think thermostats controlled via smartphone or personalized ads based on individual preferences – that require a thorough, behind-the-scenes, tech-enabled operational strategy to function fully.

Figure 1

Top tech trends influencing business strategy



“Highly important” responses

Source: 2015 Digital Operations Revolution Survey. Question: “How important are the following technology trends to your company’s business strategy?”

The most crucial tools needed to achieve business goals include IoT, mobile technologies and applications in the cloud – and analytics to make sense of it all.

Looking ahead, spending on analytics is somewhat more robust relative to other top technologies, indicating the critical importance of making meaning from the flood of data coming into the operations function.

The waves of change are not slowing down in traditional areas of operations, such as production or procurement, either. And collaboration and social technologies, as well as newer offerings like additive manufacturing, are gaining traction.

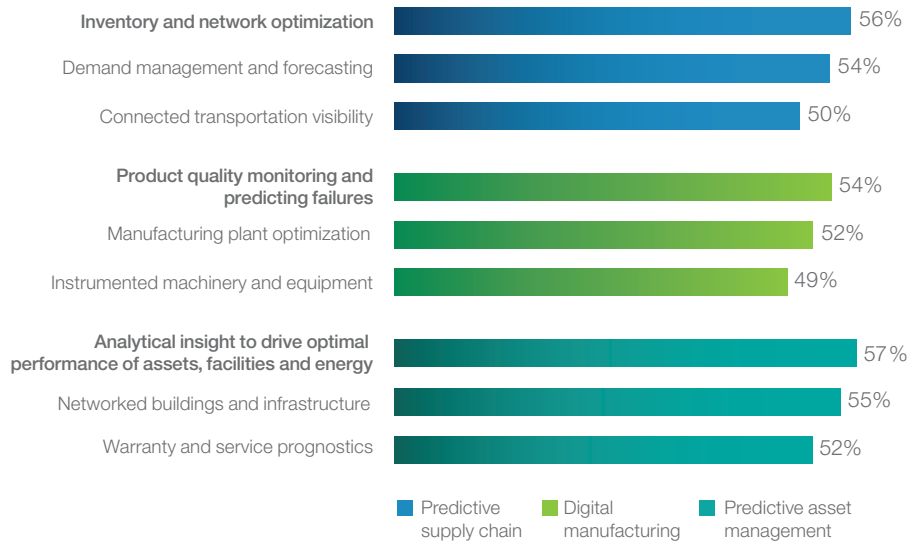
Budgets for digital operations initiatives are generally tracking these business and technology trends, according to survey responses regarding top investments in the past three years and projected investments for the next three. Investments in building out cloud applications and ramping up analytics capabilities top the list, followed by IoT and mobile technologies. Looking ahead, spending on analytics over the next three years is expected to be somewhat more robust relative to other top technologies. This finding indicates the critical importance of extracting meaning from the flood of data coming into the operations arena.

The impact of big data on operations is broad and deep, with no area more vital than predictive analytics. Over the next three years, our research revealed that several factors will drive the adoption of predictive analytics. Foremost among these are increased operational efficiency, better customer service and improved supply chain management.

As a key component of digital operations, predictive analytics requires its own subset of supporting technologies. Businesses already have a fairly mature toolkit – well over half of respondents say their applications are “quite developed” or “highly developed” in areas like predictive supply chain, digital manufacturing and predictive asset management (see Figure 2).

Figure 2

Growing maturity for analytics applications

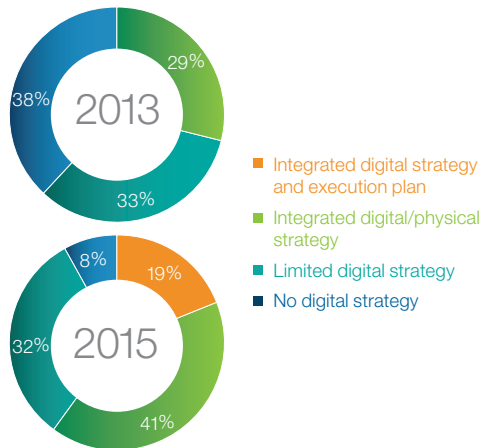


“Quite developed” and “Highly developed” responses

Source: 2015 Digital Operations Revolution Survey. Question: “How mature are your applications of predictive analytics in the following areas?”

Figure 3

Increasing maturity of digital operations strategies



Source: 2013 IBM Chief Supply Chain Officer Study, “The customer-activated supply chain.” 2015 Digital Operations Revolution Survey. Question: “Which of the following best describes your firm’s digital operations strategy today? Select one.”

One leading appliance manufacturer is using IoT and predictive analytics to improve product and service quality. Equipping appliances with a cloud-based preventive maintenance and analytics tool allows the company to capture and analyze real-time data. This data not only provides diagnostic information to call center agents and service technicians, but also helps the company’s R&D and engineering departments improve product design and quality.

By using predictive analytics, the manufacturer has reaped quantifiable business benefits, such as decreased call times in the customer service department and increased customer satisfaction. What’s more, the manufacturer has been able to engage with new and current customers in ways that previously didn’t exist.

Yet most companies are still slow to apply technologies like predictive analytics toward improving business performance. Their investments in digital operations for the next three years focus on more foundational issues, like creating networked buildings and infrastructure. For the most part, respondents across industries say they will invest equally in these areas, although some variances exist. For example, companies in the consumer products, and energy and utilities industries are more focused on inventory and network optimization than on infrastructure, such as buildings, facilities and other hard assets.

But just adding technology or increasing budgets is not enough. Purposeful transformation must integrate digital tools, security and talent into operations strategy in support of larger business goals. This remains a work in progress. While a vast majority of companies have at least outlined a digital operations strategy – and far more companies have progressed in this area than just two years ago – less than one-fifth have a fully thought-out strategy and execution plan, and have taken steps to transform operations and their industries (see Figure 3).

Recommendations for building a digital operations strategy

Making changes of the scale and complexity required to profit from the digital operations revolution demands careful planning. Figuring out which technologies to adopt, working through the implementation process and setting company-wide strategies to adjust to these changes are not simple tasks.

When creating a digital operations strategy, companies need to:

Think beyond the possible. Digital operations involves changing the way work is done and how processes fit together, not just adding technology. Be sure that the C-suite shares a vision for the company's culture. Put enterprise-wide communications and adoption disciplines in place to help employees adjust to transformation and embrace new ways of working.

Crunch the numbers. Build a robust analytics component into your strategy to get full value from your digital operations data. Give information access to every department that has a use for it, and provide education on what to do with it.

Look to the marketplace. Understand how customer needs are changing to gain a deeper understanding of your internal priorities. Regularly evaluate your own business model to see how it maps to changing consumer demands, and develop tactical plans to make necessary adjustments.

Keeping data safe

The rewards of digital operations technologies come with major risks for those who do not effectively guard their systems and data. The interconnectivity of mobile and cloud applications, as well as the smart devices that access them, raises the threat level for companies as they remake operations, from supply chain processes to product and service innovation.

A world of connected “things” makes every part of the network a potential attack point for malicious actors. The “bad guys” may try to obtain private or confidential data, manipulate or control devices, or confuse or deny service to applications that use and supply data within IoT systems. These risks are real across industries, but may be even greater when it comes to IoT systems that support manufacturing, energy, transportation and other industrial sectors of the economy. As the “things” that power these sectors are connected to the Internet to enable broader visibility, control and condition-based maintenance, they also become vulnerable to security attacks.

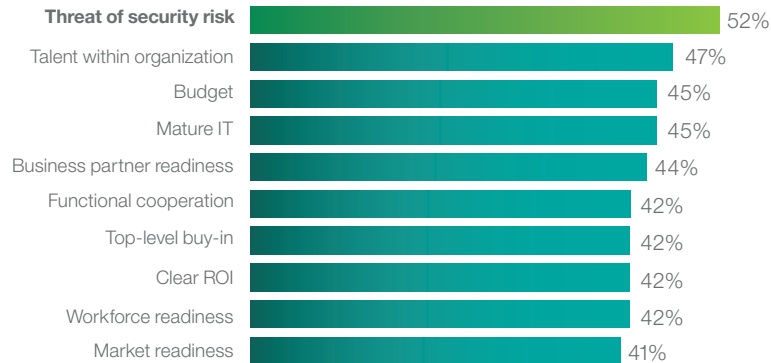
This emerging reality is a major focus area for executives: cybersecurity risk is cited as the top challenge in developing digital operations initiatives (see Figure 4). Budget allocations, too, indicate increased concern: respondents say security is their primary investment area for the next three years.

Concerns about security reach across the leadership ranks. Chief Information Officers (CIOs) and Chief Operating Officers (COOs) both cite it as a top challenge, while those who might be expected to know the most – vice presidents of analytics – single out security as their top concern more frequently than any other executive role.

A cyber attack can happen to a business anytime, anywhere. If not quickly detected and halted, it can imperil both revenue and customer goodwill. Risks of this magnitude require more than vigilance.

Figure 4

Cybersecurity is a top challenge



Source: 2015 Digital Operations Revolution Survey. Question: "To what extent do the following present a challenge as you develop these digital operations initiatives?"

Thus, a large conglomerate in the Asia Pacific region, with subsidiaries in the automotive, leisure, logistics, chemical and airline industries, is taking a proactive approach to even the most minor security incidents. The company has implemented a cybersecurity solution to centrally monitor and analyze network traffic and data from its subsidiaries' disparate operational systems. This solution provides a high-level view and the real-time insight management needs to spot potential threats early, mitigate them quickly and implement measures based on predictive analytics to prevent further attacks.

Recommendations for digital operations security

Securing digital operations is complex work. It blends approaches from mobile and cloud architectures with industrial control, automation and physical security. The COO needs to work hand-in-hand with the Chief Information Security Officer (CISO) to evaluate and protect specific business use cases to make them resistant to operational risk.

Key steps include the following:

Build your baseline. Develop initial security requirements by evaluating use cases and risk profiles. Prioritize security implementations by tactical risk. Build on these experiences to develop common security deployment scenarios, core architectural foundations and a competency center for the future.

Don't reinvent the wheel. Use familiar techniques and technologies whenever possible. Apply the approaches honed over many years, such as authentication, authorization, auditing, encryption and data integrity safeguards, to meet new challenges.

Create a trusted ecosystem. Consider the entire landscape of devices, networks and application systems when assessing security scope. Along with internal operations, think about business partners, service providers and customers.

You still need people in a digital world

The best tools, strategies and security still require human talent to make them work well. Attracting and keeping the right people is more challenging than ever, as changing business models shake up traditional operations and demand new skill sets from employees.

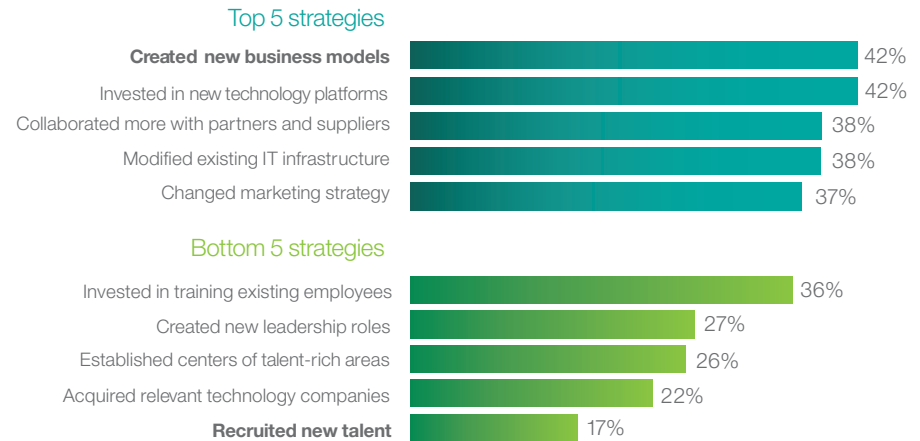
Executives understand this imperative. When asked which global trends they expect to have the most impact over the next three years, they rank talent shortage within the organization third after only economic conditions and technology change. And they say that lack of talent is a top obstacle impeding digital operations initiatives.

However, understanding and action are different things. Many businesses are struggling to keep up with talent demands imposed by the shift to digital operations, whether they're finding and recruiting workers, or putting the training programs and accelerated change management practices in place to prepare employees for what lies ahead.

Lack of available talent is the second-highest rated challenge to digital operations initiatives, according to respondents. While talent issues may be on executives' radar, relatively few are turning thought into action.

In fact, a surprising number of companies are not doing enough to fix their shortcomings in this area. Talent-related issues are getting lip service instead of the attention they need. Less than one-fifth of executives have recruited new talent to transform their digital operations, and just over one-quarter have created new leadership roles or established centers in talent-rich areas (see Figure 5).

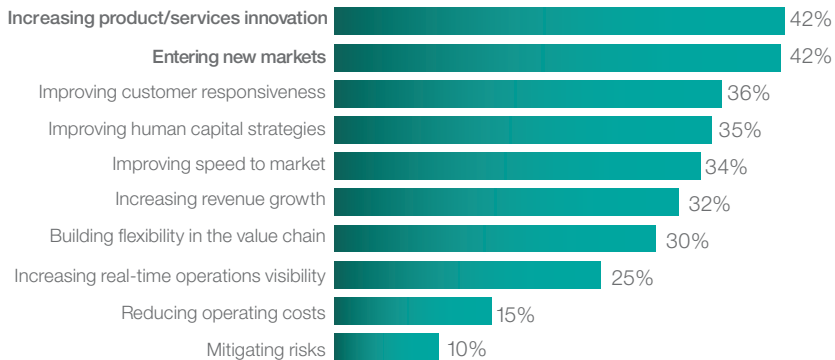
Figure 5
Steps toward digital transformation



Source: 2015 Digital Operations Revolution Survey. Question: "What steps, if any, have you taken to transform your company's strategy around digital operations? Select all that apply."

And the human factor will only grow in importance. Increasing innovation, entering new markets and improving customer responsiveness are top-ranked business initiatives for the next three years (see Figure 6). Without the right talent strategies incorporated into their digital strategies, companies are not likely to achieve these business goals. However, only one-third of executives cited human capital strategies as a top business initiative for that same period.

Figure 6
Business initiatives center on innovation and growth – not people



Source: 2015 Digital Operations Revolution Survey. Question: "Which business initiatives do you expect to be of greatest importance to your firm over the next three years? Select the top three."

Figure 7
Culture is shifting to support digital operations strategies



There is a strategy in place to help our employees adapt to the changes associated with digital operations



Our executives recognize the amount of change needed to support our digital operations strategy



Our company's shift toward digital operations is being supported by change management

“Agree” and “Strongly agree” responses

Source: 2015 Digital Operations Revolution Survey. Question: “Thinking again about your digital operations strategy as a whole, to what extent do you agree with the following statements?”

Some companies are making progress toward establishing workforce strategies, particularly when it comes to cultural change. For example, many executives recognize the need for comprehensive change management strategies. Nearly three-quarters say they have a strategy in place to help employees adapt to changes associated with digital operations (see Figure 7).

A steel manufacturer based in Japan has an integrated digital operations strategy that includes a plan for people. To maximize operational performance, standardize processes and improve product quality, the company needed to share best practices, as well as technical skills and knowledge, across business units.

The company found a solution to this human challenge using cognitive computing, which combines content and data from many sources to recommend a course of action. Now the know-how of experienced engineers is available throughout the enterprise, accelerating rapid skills transfer. What’s more, the manufacturer can recognize trends in design and manufacturing processes, leading to improvements in product quality.

Recommendations to get back on the human track

The human capital implications of the digital revolution are huge. New technologies and business models affect virtually everyone, regardless of industry, functional area or profession. Transforming talent management requires a fresh focus on recruitment and training, as well as on leveraging mobile and social technologies to promote and enhance communication, collaboration and engagement.

To facilitate this transformation, companies can take the following actions:

Make people part of the plan. Find the capabilities and talents that create differentiation. Include human capital strategies in your overall digital operations strategy. Make sure you have the processes, technology and governance in place to assess and act upon skills needs, along with metrics to measure results.

Recognize that you get what you pay for. Invest in a digital talent management program to recruit and train for the right skills, and create talent-rich centers of excellence. Be ready to pay for the quality of people you need.

Embrace cultural change. Digital transformation requires a disciplined change management program. Employees take their cues from leadership, so be ready to articulate your vision and model desired behaviors. Policies, processes and tools must align with the desired behaviors to support the change agenda.

Business strategy these days is customer-driven. Executives tell us they are highly focused on initiatives to increase operational innovation related to products and services, or enter new markets. They also are intent on improving responsiveness to customers and speed to market. These trends are widespread, but not evenly distributed across major industries (see sidebar).

Industry transformation, where are you?

New technologies and changing customer expectations are transforming business models and blurring traditional industry boundaries. Interconnected networks of businesses, suppliers and customers allow companies to develop products and services outside sector lines. Electronics, telecom and technology companies are moving into industrial and automotive industries, while manufacturers are applying the new technologies to have more direct and real-time contact with customers. In this landscape, leveraging technology to stay ahead of competitors – regardless of industry – is crucial.

However, not every sector is moving at the same rate. Industrial products companies already understand the new imperatives, as they are far ahead on the industry maturity map (see Figure 8). They have embraced the digital revolution with speed and clarity of purpose, increasing innovation through new business models and supporting digital technologies. Other advanced industries, such as automotive, consumer products and healthcare, have set their sights on cloud computing and predictive analytics.

But other sectors are advancing at their own pace. Among the key industry variations identified in our survey:

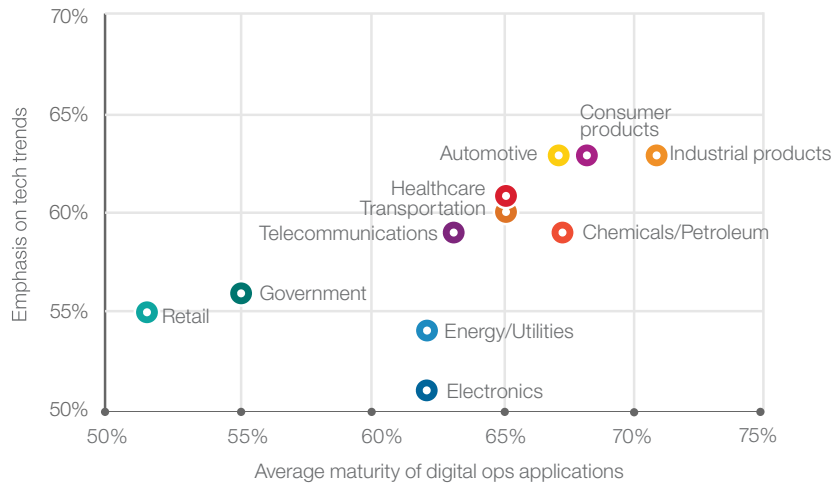
- Energy and utilities companies have created new business models and invested in new tech platforms more than other industries, but are lagging in some specific applications of digital operations, like fleet management and warehouse control.
- As long-time tech laggards, fewer retail firms said they have taken steps to transform with regard to digital operations.

- Electronics firms are behind in some key applications of digital operations, like customer order tracking, but excel in digital manufacturing and are more focused on robotics than any other sector.

As an increasingly broad range of industries adopts digital technology to reshape their markets, more companies will move along the maturity curve, increasing their capabilities and return on investment. And the more that companies embrace digital operations, the more they will transform their current industries and create new ones.

Figure 8

Digital transformation industry maturity at a glance



Source: 2015 Digital Operations Revolution Survey. Questions: “How important are the following technology trends to your company’s business strategy?” and “How mature are your applications of digital operations in the following areas today?”

Are you ready to take the lead in digital operations?

- How are you optimizing your digital and physical components across the different aspects of your business strategy and operating model?
- What are you doing to leverage key technologies (IoT, cloud, analytics, mobile and collaborative/social tools) to engage with and create new value for your customers?
- How is your company taking advantage of new technologies to innovate, differentiate and grow?
- What is your company's digital operations strategy? Is it integrated to include your security and talent challenges?
- How will you drive the digital agenda in your industry rather than having it imposed on you by competitors?

Methodology: How we conducted our research

IBM and Oxford Economics surveyed 750 executives, most of them from the operations function and all with direct knowledge of it, about the ways their companies are retooling to improve digital operations, particularly in the areas of IoT and predictive analytics. This research included respondents from companies with at least USD 500 million in revenue in a dozen countries around the world and across a variety of industries.

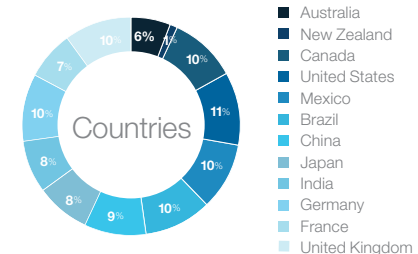
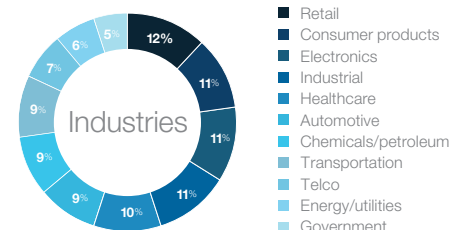
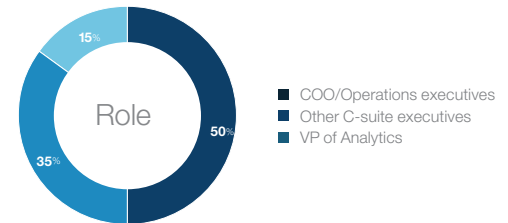
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Related publications

Scanio, Julie, Karen Butner and Dave Lubowe. “Digital operations transform the physical: How real-time insights can revolutionize value chains.” IBM Institute for Business Value. February 2015. www-935.ibm.com/services/us/gbs/thoughtleadership/digitaloperations/

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Notes and sources

- 1 Hammer, Michael. “Deep Change: How Operational Innovation Can Transform Your Company.” *Harvard Business Review*. April 2004. <https://hbr.org/2004/04/deep-change-how-operational-innovation-can-transform-your-company>
- 2 *ibid.*

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