



Metamorworks/Getty Images

# What separates leaders from laggards in the Internet of Things

Michael Chui, Brett May, Subu Narayanan, and Ridham Shah

Even among companies working at scale with the Internet of Things, there's a wide gap between top and bottom performers. Nine practices distinguish the leaders from their less successful peers.

For all the excitement that has built up around the Internet of Things (IoT)—the network of digitally connected devices whose economic value could amount to trillions of dollars per year—the IoT's impact varies greatly from one company to next. Many enterprises have launched pilot projects to develop IoT-enabled products and services or use the IoT to achieve operational improvements. Of these, less than 30 percent have taken their IoT programs beyond the pilot phase, according to our research.

Yet even among companies with large-scale IoT efforts, a significant gap separates the top tier of performers from the bottom tier. In a survey of IoT practitioners at 300 businesses with mature IoT programs (those that have expanded beyond pilot projects), about one-sixth said their companies had seen a significant payoff from IoT, an aggregate cost and revenue impact of at least 15 percent.<sup>1</sup>

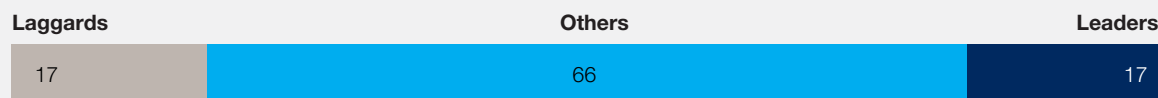
We call these companies IoT leaders. At the other end of the spectrum, about one-sixth of respondents—

<sup>1</sup> For this research, we conducted a telephone survey of 300 IoT practitioners from companies with more than \$500 million in annual revenues that are implementing IoT strategies on a large scale, with projects that have gone beyond the pilot phase and into production. Respondents were executives and senior managers (about 70 percent at or above vice president or general manager) with significant exposure to IoT (all have daily involvement with the IoT; 80 percent are very familiar or expert) and a variety of

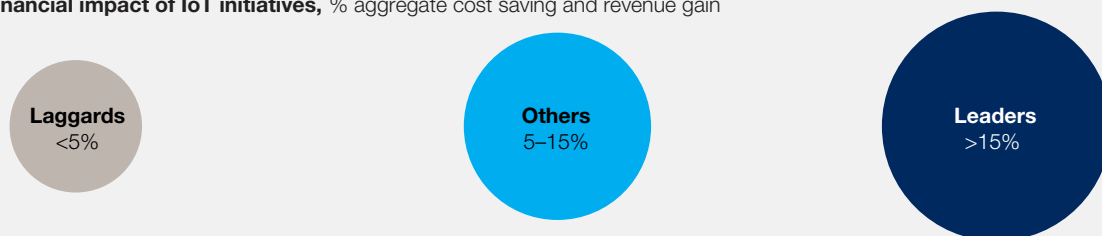
**EXHIBIT 1**

**One-sixth of companies, the Internet of Things (IoT) leaders, reported a positive impact on their costs and revenues from their IoT initiatives.**

Companies by level of financial impact from IoT initiatives, % of respondents



Financial impact of IoT initiatives, % aggregate cost saving and revenue gain



Source: McKinsey survey of IoT practitioners, 2018

the IoT laggards—said their IoT efforts had yielded an aggregate revenue and cost improvement of less than 5 percent (Exhibit 1).

What separates the leaders from the laggards? The superior performance of the leading companies appears to be a function of much more than luck. Our survey results indicate that their approaches to the IoT exhibit the following distinctive practices. These companies are aggressive: by pursuing a large number of IoT applications, they quickly climb the IoT learning curve and pass the point at which new applications consistently generate a great deal of value. They develop a clear idea about the commercial opportunities associated with IoT, and they align everyone in the organization, from the executive suite to the front lines, toward a common set of goals. And they're pragmatic about how they implement their IoT plans, building their

IoT offerings around existing products and services and relying on outside partners to furnish them with sophisticated technologies. In this article, we'll offer a closer look at the nine practices that are closely associated with IoT leadership.

### Be aggressive

The most surprising finding from our survey research is that IoT leaders implement many more potential IoT applications than their less successful peers. That might sound obvious. All other things being equal, one could reasonably predict that implementing more IoT applications produces more benefits. What's less obvious is that the IoT has a steep learning curve, such that companies that get an early start or move quickly will reap the rewards of their efforts before slower-moving companies. Moreover, IoT leaders change business processes to capitalize on the potential of their IoT applications,

functional roles (C-suite, engineering, finance, HR, IT, and operations). Organizations covered 11 major industry segments and four major geographies (Canada, China, Germany, and the United States).

and they go after opportunities to use advanced IoT end points such as autonomous vehicles and wearable devices. In these ways, the IoT rewards aggressive players.

### Practice 1: Implement lots of use cases

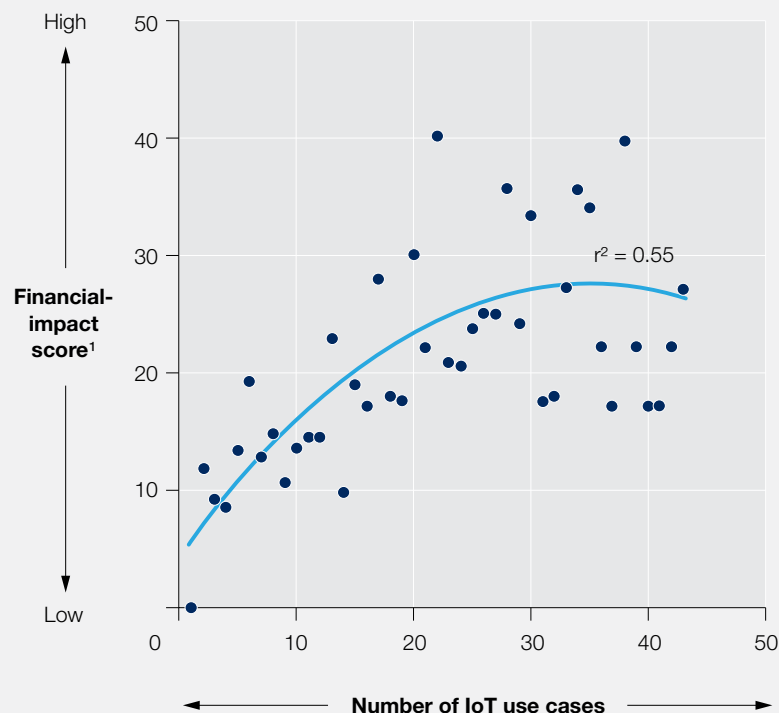
We noted earlier that many companies have yet to move their IoT programs beyond small-bore pilot efforts. The reasons for this phenomenon vary, but one we hear often is that initial IoT use cases seldom produce the kind of significant financial impact that might encourage companies to press ahead with others. As it turns out, it's not just those few use cases

that can be unimpressive. Our survey suggests that the first 15 or so IoT use cases typically have a modest payback—and the average payback continues to rise until companies have implemented around 30 use cases (Exhibit 2). In other words, the twentieth IoT use case that a company implements will likely have a greater financial impact than its tenth.

The formula for real financial impact—using the IoT in a high number of instances—was also evident when we compared IoT leaders and laggards. IoT leaders pursue 80 percent more IoT use cases than IoT laggards. The difference points to a

## EXHIBIT 2 As companies implement more Internet of Things (IoT) use cases, they see increased financial impact, with the effect leveling off at around 30.

Financial impact per IoT use case



<sup>1</sup>Financial-impact score: a metric synthesized from several cost, revenue, and/or margin-impact metrics, as measured on a per-use-case basis.

Source: McKinsey survey of IoT practitioners, 2018

disproportionate increase in financial gain: IoT leaders anticipate that their IoT use cases will boost their gross profits by 13 percent over the next three years, three times as much as IoT laggards.

One global transportation-equipment manufacturer's experience with developing IoT-enabled products underscores the importance of scale. After the company launched its IoT strategy with four minimum viable products (MVPs), executives soon found that performance wasn't improving as much as expected. A cadre of IoT leaders pushed back against voices of caution and tripled the number of MVPs. It turned out that putting managers in charge of more IoT projects and products focused their attention, creating a bias toward action. Previously unexpected synergies soon emerged: engineers used similar data architectures for multiple offerings and discovered ways the digital end products could support one another. Before long, the more aggressive slate of use cases had produced more than \$1 billion in new revenue.

### **Practice 2: Change business processes to unlock the IoT's value**

Understandably, many executive teams have perceived the IoT mainly as a technology challenge and put their chief information officers (CIOs) at the helm of their IoT efforts. Casting the IoT as a pure technology play, though, carries the risk that companies will overlook all the value they might capture by redesigning processes to take advantage of the IoT's capabilities. Using remote sensors to collect performance readings from a gas turbine, for example, can supply a utility with enough data to perform predictive maintenance on the turbine, which can be more efficient than doing preventive maintenance according to a preset schedule. But if utility workers don't align their work routines with the new predictive-maintenance approach, then the potential efficiencies can't be realized in full. No wonder, then, that survey respondents at IoT leaders

were three times more likely than IoT laggards to say that managing changes to business processes is one of the three most important capabilities for implementing IoT solutions (Exhibit 3).

This distinction was manifest at one metals manufacturer. The company outfitted three rolling mills with IoT sensors to capture and analyze previously unused data, with the aim of diagnosing and resolving capacity constraints at the facility. But mill operators didn't act on the insights generated by the system, so there was no financial impact. Management responded by simplifying the complex metrics the system was producing and by changing the inspection routines of plant supervisors, whereby they checked more often with mill operators about how many times they had to wait for materials to arrive—and why delays had occurred.

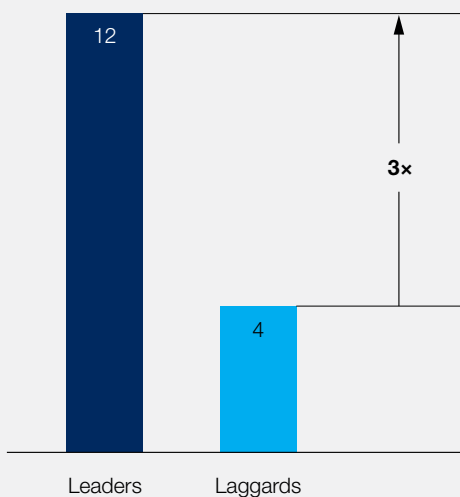
The repeated queries prompted the mill operators to look into the delays and identify several hidden causes of slowdowns and stoppages, issues that earlier problem-solving efforts had missed. Supervisors and operators also added problem-solving sessions to their daily plant-area “huddles” so they could correct the hidden causes of material-flow backups. Overall equipment efficiency subsequently increased by 50 percent, saving hundreds of millions of dollars in planned capital expenditures.

### **Practice 3: Use advanced end points**

IoT hardware can be applied in various settings to a wide array of devices, such as sensors embedded in heavy equipment, electronically tagged items traveling along the supply chain, digital security cameras, and smart household appliances. Some of the most promising IoT solutions involve advanced technology end points. Augmented and virtual-reality applications, for example, can feed real-time instructions to workers based on what they are seeing in the field. Autonomous cars and drones require dozens of IoT devices, from the many sensors that detect a vehicle's condition, location, and

**EXHIBIT 3****Internet of Things (IoT) leaders are more likely to rank business-process change as a top capability for implementing IoT solutions.**

Importance of business-process change,  
% of respondents who rated it a top-3 capability



Source: McKinsey survey of IoT practitioners, 2018

performance to the actuators that control steering, braking, and acceleration. And the wearable devices that people attach to their bodies monitor activity levels or chronic conditions and feed that data into software that gauges the user's health and wellness. We refer to augmented-reality/virtual-reality devices, drones, autonomous vehicles, and wearables collectively as "advanced end points."

Our research suggests that IoT leaders are more aggressive than IoT laggards in developing applications with advanced end points: they are doing more with these end points now, and they plan to do more in the future (Exhibit 4). Moreover, the leaders report high levels of satisfaction with their efforts to develop applications with advanced end points.

**Maintain a common sense of direction**

To make the most of their investments in the IoT, companies need to be judicious about integrating IoT applications into their products and services as well as their internal operations. Doing that requires a well-defined vision for what the company is trying to accomplish with its IoT strategy, along with an organization-wide commitment, anchored in the C-suite, to pursue that vision.

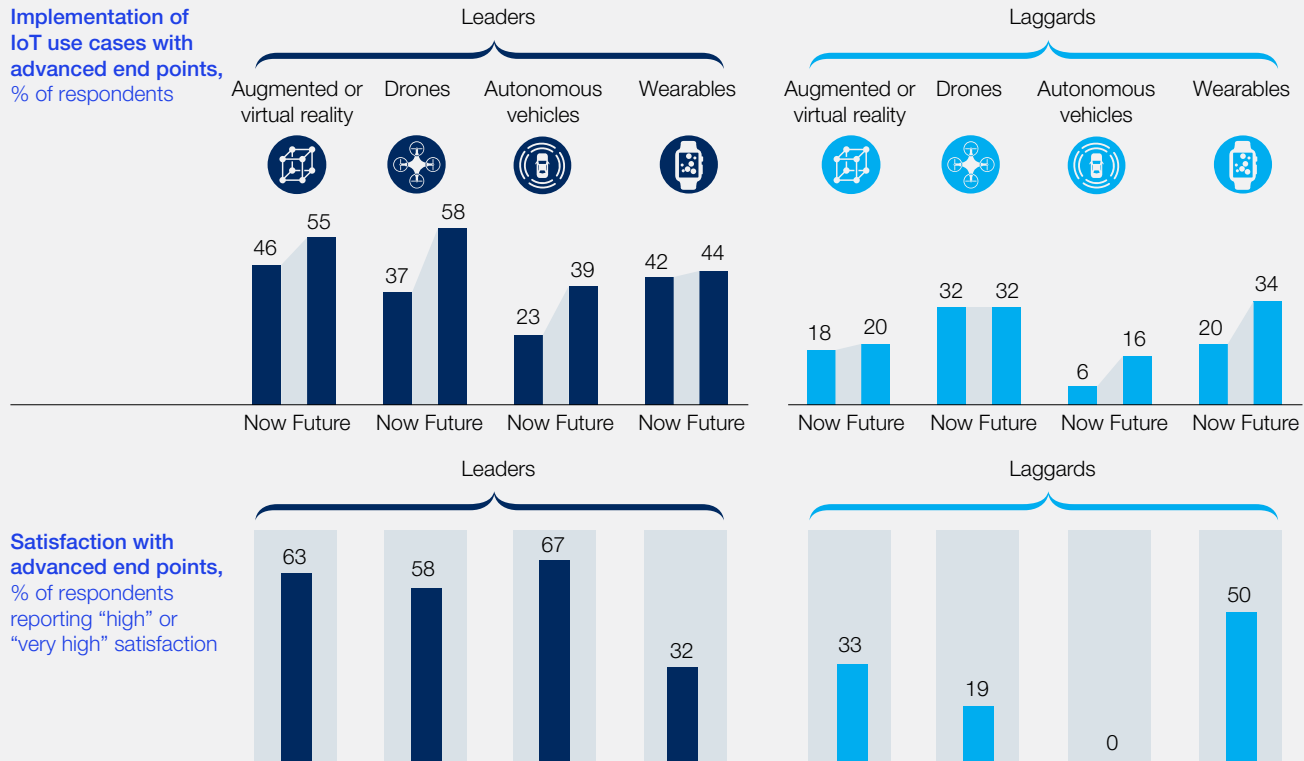
**Practice 4: Define how the IoT will create value**

IoT leaders were 75 percent more likely than laggards to cite the preparation of a strong business case or articulated vision for value creation as a key success factor for their IoT programs (Exhibit 5). Without such a vision, companies can find it difficult to tie their IoT programs to their business strategies or prioritize a coherent and well-integrated set of



## EXHIBIT 4

### Internet of Things (IoT) leaders are outpacing laggards in the use of advanced end points, and they are more satisfied with the results.



Source: McKinsey survey of IoT practitioners, 2018

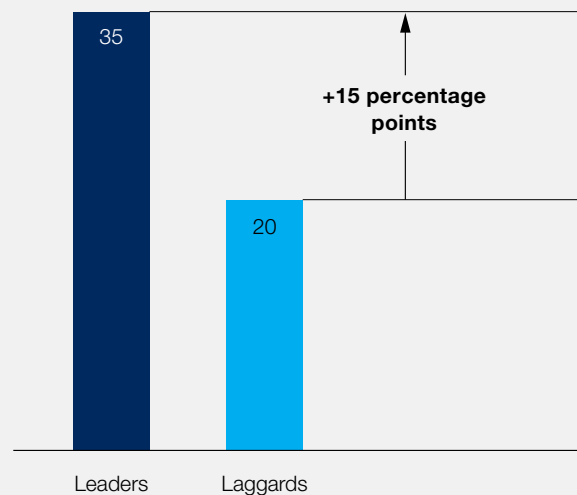
use cases. The best IoT visions we've seen include a value proposition (offerings that solve problems for customers better than what's available now), a delivery model (a route to market for IoT products and services, supported by the business and its value-chain partners), and an economic model (a way for the business to capture some of the value created by its IoT products and services, while sharing some value with customers).

This forward-thinking stance was evident at a leading appliance company, which saw an

opportunity to grow by introducing a line of IoT-enabled products. The company took a bottom-up approach to building its IoT business case. After generating product ideas based on industry research and survey findings, it rated each idea's problem-solving potential for customers and estimated profitability. Then it assembled a slate of high-priority ideas that it wished to pursue. The company then worked out how it would share the value of each idea with the outside partners that would help to build an enabling IoT platform. The company has begun developing connected products

**EXHIBIT 5****Internet of Things (IoT) leaders are more likely than laggards to say that a strong IoT business case is a top factor in the success of their efforts.**

Importance of “strong business case and vision for value creation,”  
% of respondents who rated it a top-3 success factor



Source: McKinsey survey of IoT practitioners, 2018

and anticipates that they will generate substantial revenues within two years.

**Practice 5: Spur action from the C-suite**

Executive-level involvement appears to be a factor in the sophistication of IoT programs: 72 percent of the surveyed companies, all of which have mature IoT programs, have appointed a member of their C-suite to champion the IoT effort. But the leaders' IoT programs are particularly associated with a clear commitment and investment of time from the CEO. Companies in the leaders quintile were 2.4 more likely than laggards to report that their CEO serves as the champion of IoT efforts (Exhibit 6).

**Practice 6: Mobilize the entire company**

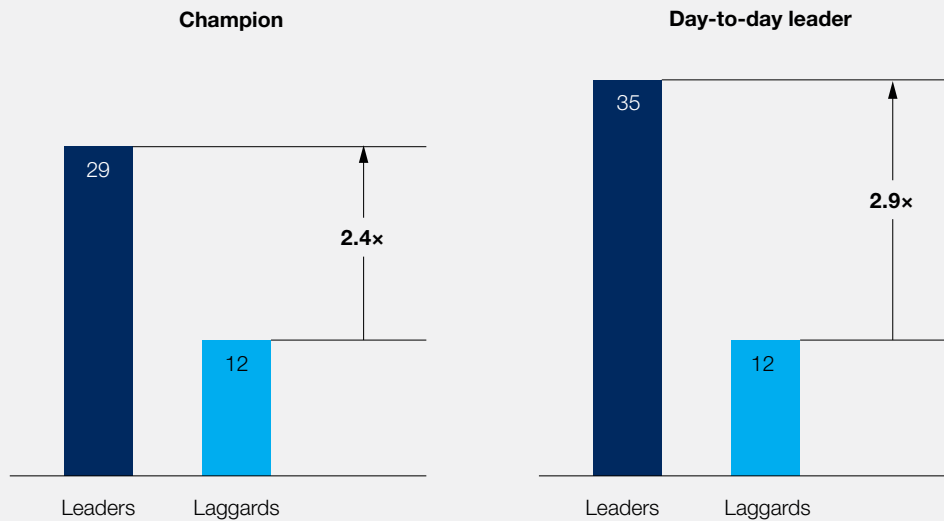
Comprehensive IoT strategies impose unfamiliar demands on every corporate activity: developing

new offerings, making and delivering goods and services, selling and supporting what's been sold, adjusting the portfolio to seize opportunities and abandon fruitless efforts, and administering central functions. To implement these strategies, executives, managers, and frontline workers need to learn fresh skills and collaborate across business and functional boundaries in novel ways.

For these reasons, it's important for the whole company to understand and get behind the IoT strategy. The difference that organization-wide commitment makes can be stark. The IoT leaders in our survey were more likely than laggards to say that strong alignment with IoT strategies and priorities across the organization is a key factor in the success of their IoT programs.

**EXHIBIT 6****At Internet of Things (IoT) leaders, the CEO is more likely to serve as the champion or day-to-day leader of IoT efforts.**

Role of CEO in IoT program, % of respondents



Source: McKinsey survey of IoT practitioners, 2018

**Be practical in execution**

IoT leaders are not only more ambitious and better coordinated than their peers. They also take a decidedly practical approach to executing their IoT plans. Instead of chasing breakthrough opportunities far beyond their core business, they use IoT applications to augment their existing offerings in ways that customers value. They don't expend effort and money to create advanced technologies if they can source those technologies more easily and inexpensively from outside partners. And they guard carefully against the cybersecurity risks that inevitably arise as they establish digital connections to thousands, if not millions, of end points.

**Practice 7: Start with existing offerings**

Besides transforming their business processes to capture value from the IoT (practice 2), companies

can generate revenues by either adding connectivity to existing products or creating new connected products. IoT leaders strongly favor the former approach. According to our survey, IoT leaders are three times more likely than laggards to say that their top IoT priority is adding IoT capabilities to existing products (Exhibit 7).

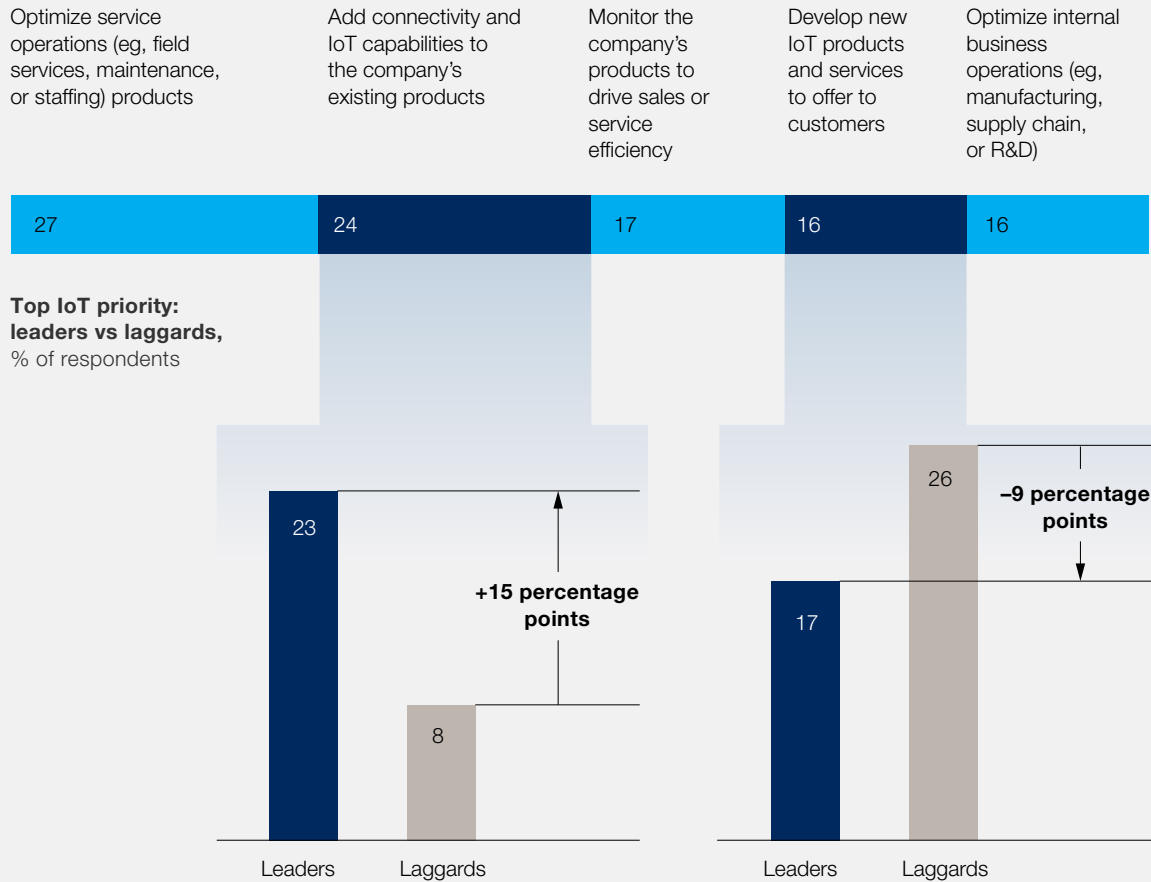
One agricultural-equipment maker chose to play to its strengths by making R&D investments aimed at IoT-enabling products and services in existing lines of business. These investments resulted in a new system that used on-farm sensors to continuously read soil conditions and irrigation levels and relay the information to a cloud-based analytics platform. Farmers could then monitor real-time variations on their mobile devices and optimize their water and fertilizer use. That, in turn, increased yields



## EXHIBIT 7

### Successful companies concentrate more on adding Internet of Things (IoT) capabilities to existing offerings than on new IoT offerings.

My organization's single highest-priority IoT effort, % of all respondents



Source: McKinsey survey of IoT practitioners, 2018

while substantially reducing water, fertilizer, and fuel costs. As the equipment maker added users, it took advantage of the growing quality and breadth of data to improve the capabilities of the system, and thereby increase its value to farmers.

#### Practice 8: Tap into an ecosystem of partners

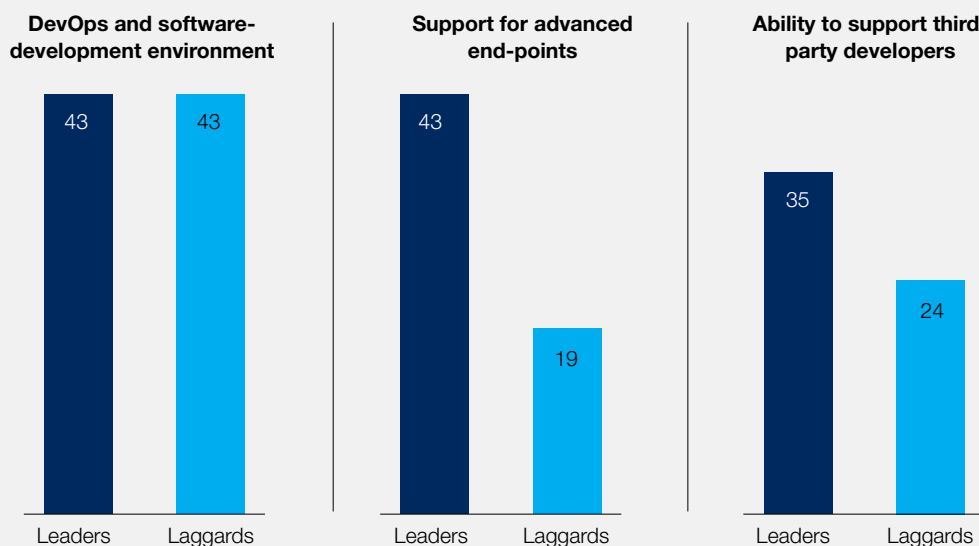
The preferences of IoT leaders suggest a greater willingness to draw capabilities from an ecosystem

of technology partners, rather than rely on homegrown capabilities. When it comes to choosing the IoT platform that will best meet their needs, IoT leaders follow an approach that is different from that of laggards.

While laggards and leaders are equally interested in the software-development environments supported by IoT platforms, leaders are more likely to choose

**EXHIBIT 8****Leaders seek Internet of Things (IoT) platforms that are broadly compatible with technologies offered by external partners.**

Requirements when selecting IoT platforms, % of respondents who ranked each feature among their top-3 requirements



Source: McKinsey survey of IoT practitioners, 2018

IoT platforms according to whether they support third-party developers and the advanced end points that are integral to practice 3 (Exhibit 8). Perhaps because these capabilities are so sophisticated, leaders are more likely than laggards to turn to outside partners for their IoT platforms. And while 90 percent of all IoT users at scale say they are using third-party IoT platforms, the leaders are 40 percent less likely to require that their IoT platform runs on-premise rather than in the cloud.

**Practice 9: Prepare for cyberattacks so they don't slow things down**

IoT leaders and laggards say that they suffer similar consequences from cyberattacks: 30 percent of respondents from each group said that a cyberattack had resulted in high to severe damage. But a higher percentage of the leaders said their companies

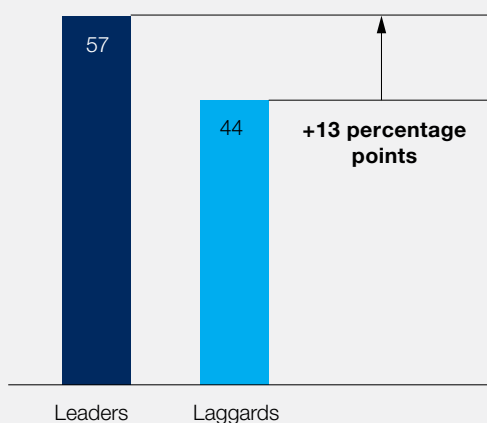
had been the target of cyberattacks (57 percent, versus 44 percent for laggards). This could be because the leaders' larger numbers of IoT use cases give them a more expansive attack surface. Nevertheless, IoT leaders are much more likely to say they are confident about their ability to handle cyberthreats (Exhibit 9). While we didn't ask them why, our experience suggests that companies usually ramp up their levels of cybersecurity protection after experiencing cyberattacks, which could leave them feeling surer of their ability to withstand subsequent attacks.



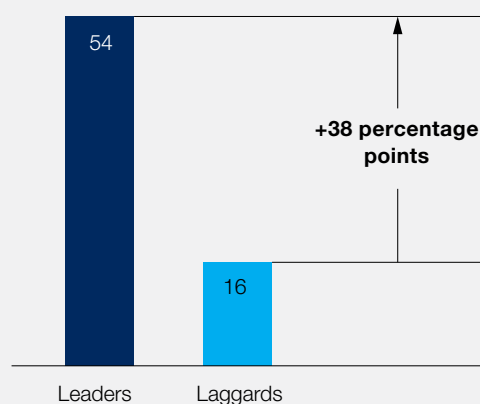
Our survey results point to an important lesson for companies working with the IoT: succeeding at scale

**EXHIBIT 9****While Internet of Things (IoT) leaders sustain more cyberattacks, they are much more likely to express confidence in their ability to handle attacks.**

Companies that have had cyberattacks,  
% of respondents reporting that their  
companies have been targeted



Confidence in an organization's ability to  
respond to cyberattacks, % of respondents  
who say they are confident



Source: McKinsey survey of IoT practitioners, 2018

depends greatly on sound decisions about business fundamentals—strategy, leadership, investment, organizational change, partnerships—and not just on decisions about technology. This is not to say that technology doesn't matter. It does, of course; IoT leaders pay a great deal of attention to technological

matters, from choosing platforms and assembling capabilities to preparing for cyberattacks. The difference is that IoT leaders complement their technological prowess with business discipline and a bold, enterprise-wide commitment to a well-defined course of action. ♦

**Michael Chui** is a partner in McKinsey's San Francisco office; **Brett May**, chief operating officer of McKinsey's IoT Ventures, is based in the Silicon Valley office; **Subu Narayanan** is a senior expert in the Chicago office; and **Ridham Shah** is a specialist in the Dallas office.

Copyright © 2019 McKinsey & Company. All rights reserved.