Harvard Business Review

THE DIGITAL TRANSFORMATION OF BUSINESS

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Peter Cray

In today's mobile-first, cloud-first world, technology is interwoven into every aspect of our daily lives. The cloud-enabled applications on our mobile devices guide our decisions and instantly connect us to our social circles. Technology has clearly transformed our personal lives.

Can we say, with confidence, the same about business? Are organizations experiencing the same kind of profound changes in daily operations as they adopt these technologies?

To understand how the megatrends of cloud, mobile, social, and big data are affecting businesses, Microsoft sponsored the study "The Digital Transformation of Business" conducted by Harvard Business Review Analytic Services. The survey, polling 537 executives of enterprise organizations, provides surprising insights into the transformative effects of technology on business operations, including how:

- Mobile is enabling new business scenarios
- Cloud computing is driving business agility
- Big data is helping companies innovate
- Social channels are transforming core business processes

This report is designed to help you understand how your organization compares with others in the progression of these transformations. The survey and report will help stimulate and guide the conversations about technology adoption that are undoubtedly swirling within your organization. Use this link to forward the digital version to colleagues or to print additional copies.

At Microsoft Consulting Services' Enterprise Strategy Program (ESP), we help organizations like yours focus those conversations to shape a "digital transformation strategy." Then, through a strategic approach, we can help you implement technology that delivers clear results, including:

- Getting to market faster and more effectively
- Innovative new business models, products, and services
- Optimized business operations
- Exceptional end-to-end customer experiences

Through ESP's legacy of business-first engagements across industries and geographies around the world, Microsoft offers a multidisciplinary approach marshalling the most innovative and productive uses of technology. Let us help you solve your organization's most complex challenges, transforming operations through technology.

Peter Cray
Corporate Vice President, Business Operations, Strategy & Marketing, Microsoft

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THE DIGITAL TRANSFORMATION OF BUSINESS

Although the four "megatrends"[1] of cloud, big data, mobile and social technologies are clearly having a positive impact, industry watchers who believe that only a few early adopters have been able to transform their organizations with these technologies are mistaken. Digital transformation is occurring rapidly at a majority of public and private sector organizations. This is the primary finding of a recent survey of 537 *Harvard Business Review* readers at large and medium sized public and private sector organizations, 45 percent of which are either executives or senior managers. Figure 1 (For additional details about the survey demographics and methodology, see page 13.)

The survey found that business leaders are not simply deploying the four technologies to boost efficiency or otherwise cut costs. Instead, the research shows that firms are embracing the megatrends to craft new business models, develop new revenue streams, or drive other material changes that lead to an increase in the top or bottom lines.

The survey found that among the areas where these technologies are having the biggest impact, five of the top six are top-line or customer-facing: improving customer service (53 percent); increasing productivity (52 percent); developing new services (50 percent), business models (42 percent), and products (41 percent); and increasing revenues (40 percent). Looking through 2015, the relative significance of the megatrends to goals that demand innovation, such as increasing revenues, developing new business models, and improving market share, is forecast to grow significantly.
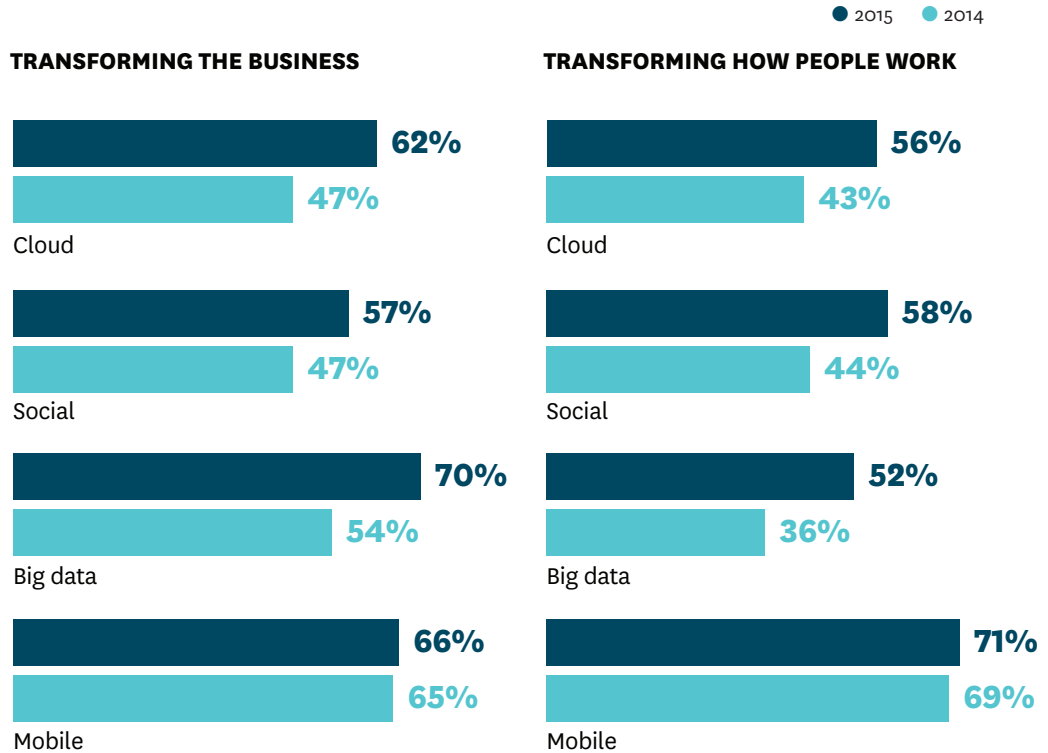
These survey results bolster the growing consensus among academics, consultants, and other industry experts that simply spending more on emerging technologies isn't enough to boost business outcomes. Instead, companies that both identify which core business capabilities they need to differentiate and make a commitment to transform these core business capabilities with the right digital technology will greatly outperform competitors who don't.

For example, a new study by George Westerman, Didier Bonnet, and Andrew McAfee found that firms with a strong vision and mature processes for digital transformation were more

FIGURE 1

TRANSFORMING ORGANIZATIONS AND HOW PEOPLE WORK

Among companies where big data, cloud, mobile, and social technologies are critical parts of the infrastructure, these technologies are, or will soon be…

● 2015   ● 2014

TRANSFORMING THE BUSINESS

Cloud
- 62%
- 47%

Social
- 57%
- 47%

Big data
- 70%
- 54%

Mobile
- 66%
- 65%

TRANSFORMING HOW PEOPLE WORK

Cloud
- 56%
- 43%

Social
- 58%
- 44%

Big data
- 52%
- 36%

Mobile
- 71%
- 69%

profitable on average, had higher revenues, and achieved a bigger market valuation than competitors without a strong vision.[2]

As with any emerging technology, however, there are significant challenges associated with cloud, mobile, social, and big data initiatives. The survey suggests that the primary risks preventing their wider adoption are data security issues, lack of interoperability with existing IT systems, and lack of control. However, executives from leading organizations—several of whom were interviewed for this report—are overcoming those hurdles to achieve top-line and customer-facing business benefits.

MOBILE ENABLES NEW BUSINESS SCENARIOS

According to the survey, mobile initiatives are the most frequently adopted of the four megatrends. They have already transformed business operations and changed the ways employees work. Organizations' efforts in this area include equipping employees with smartphones and tablets; developing mobile applications for customers, employees, and partners to use; and making changes to internal IT infrastructure to provision and manage a bring-your-own-device (BYOD) environment.

Forty-four percent of survey respondents say that mobile is now a critical part of their infrastructure. It's especially important in some industries—51 percent of the respondents in the utilities and technology sectors indicated that mobile devices and access are critical. Nearly two-thirds (64 percent) of respondents say that "anywhere access" to corporate apps and data is the biggest benefit to using mobile, followed by increased productivity (53 percent). The two are undoubtedly linked, as mobile access to systems optimizes employee time. Figure 2

A majority of survey respondents indicate that putting mobile functionality in the hands of employees is now a key requirement, and leading companies are also leveraging the growing ubiquity of smartphones to innovate and drive top-line revenue growth.

Management of the Detroit Lions professional football team, for example, is always looking for ways to improve the fan experience. In addition to offering wireless Internet access at Ford Field to Verizon customers and launching a digital raffle for charity on game days, the Lions released a free smartphone application that features exclusive in-stadium game day content, including instant replay from several different camera angles for every play, and concession maps. Eventually, the Lions intend to add other features to the smartphone app, including in-seat concession ordering. "Mobile is a gateway to our fan base," says Thomas Horrom, vice president of technology for the Detroit Lions. "Without it, we're not able to get creative or innovative in our engineered touch points."

Delta Air Lines is another company that is using mobile technologies to innovate. In 2013, the airline announced it had begun equipping its 19,000 flight attendants with mobile devices, which have increased incremental revenue from in-flight purchases.[3] But enterprise applications consultant Josh Greenbaum says the Delta mobile solution is delivering more than a streamlined buying process. "It's a full-fledged mobile sales terminal for the whole customer experience," says Greenbaum. Eventually, the mobile devices—together with a growing number of in-seat flat screen TVs—will enable Delta to sell higher-value seats, book new flights, reserve hotel rooms, or rent cars while in flight, delivering new services and new sources of revenue. In addition, the airline says it will eventually provide flight attendants with customer-specific information from Delta's customer relationship management (CRM) system on their mobile devices to enable more personalized service. "That's pretty transformational," says Greenbaum.

The widespread use of mobile technologies is also having an impact on the public sector. For example, the Metropolitan Police in the United Kingdom wanted to dramatically improve the way suspects brought into the police station were processed. Aside from the fact that the suspects weren't always cooperative, the technology used to capture photos of the suspects was aging, and image capture had to be performed in a fixed manner by trained specialists in a specified location. At the end of the day "it was a cumbersome and difficult process," says Richard Thwaite, chief information officer of the Metropolitan Police.[4]

FIGURE 2

MOBILE CONNECTS EMPLOYEES TO THEIR WORK AND EACH OTHER

Benefits of using mobile devices and applications

64%
Anywhere access to corporate apps and data

53%
Increased employee productivity

34%
Increased employee collaboration
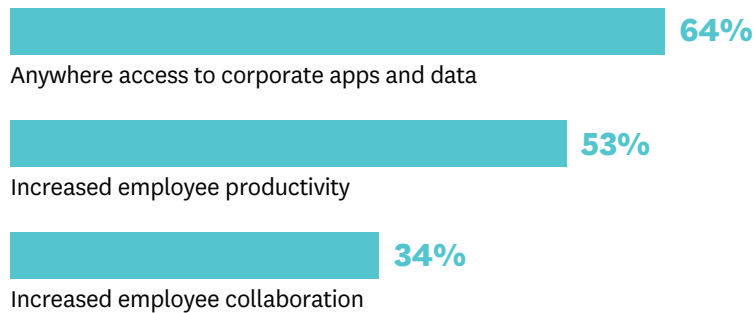
To improve its booking process, the agency deployed tablets with specialized mobile applications to police officers so they themselves could capture multiple images and video clips of the suspects, including tattoos or clothing, in a less confrontational manner, and enter it into their systems quickly. Other innovations the Metropolitan Police is pursuing include cameras on officers and a text messaging service to reduce emergency calls.

"We are going to use technology to stop crime, arrest offenders, or help victims. We need to keep police officers out of police stations and reduce bureaucracy," said Metropolitan Police commissioner Sir Bernard Hogan-Howe. "Digital policing will help us to do this."[5]

Similarly, the growing ubiquity of mobile technologies is having a transformative impact by helping to deliver healthcare services to underserved populations. Nearly one quarter of all stillborn births happen in India—600,000 a year in that country alone—largely because so many expectant mothers live too far away from sources of good maternal and obstetric care. Wipro, a system integration services company, looked at the inefficiencies in delivery of medical care to these women in India and decided that there were several areas where technology could dramatically improve the process.

Last year, Wipro unveiled a system that enabled healthcare providers to deliver remote prenatal and cardiac care using mobile technologies. The AssureHealth platform combines a mobile application, integrated medical devices, analytics, and cloud services. A wireless monitor records heart rates or uterine activity and delivers the information via Bluetooth to the mobile device. The device sends the data to the cloud, where it is analyzed, and a doctor hundreds of miles away can download the results and provide an assessment in real time. In areas of India where health services aren't readily available, explains T.K. Padmanabha, CTO of Wipro, "what is available is the phone."

With regard to the risks involved in deploying mobile technologies, the survey found that data security far outpaces other concerns. Survey respondents who said mobile technologies are a critical part of their infrastructure are also likely to name data security as their number one worry. "Employees have access to your data on a device they can—and will—lose," says David Chappell, principal with technology consultancy Chappell & Associates. The portability of data and apps, plus the use of personal devices, raises red flags.

FIGURE 3

SECURITY RISKS ARE RELATIVE

Data security ranks as an important risk, especially for mobile and cloud

70% Cloud

70% Mobile

46% Social

33% Big data
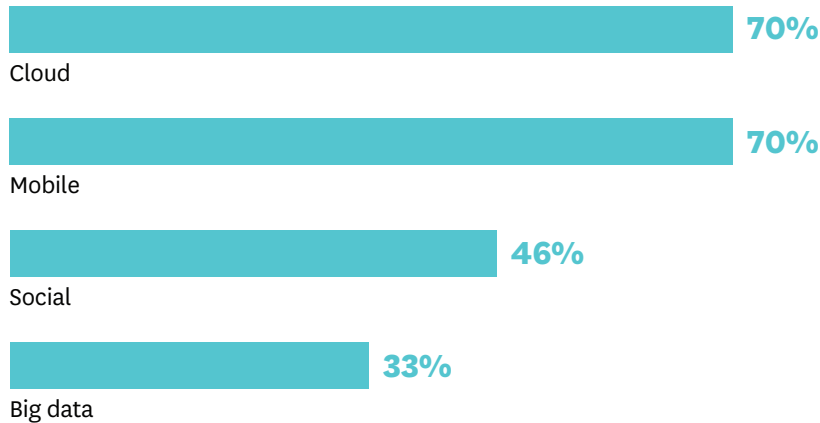
Security is an important concern with all four of the megatrends. Figure 3 When it comes to the public cloud, for example, security is "a trust issue," says Chappell. "And it takes time to build that trust." Greenbaum notes that executives are more aware of security issues these days because of recent events, including revelations about the U.S. government's National Security Agency (NSA) snooping, massive data breaches at Target and other retailers, and the Heartbleed bug that exposed vulnerabilities in a widely used web security protocol.[6]

Leading companies are dealing with the security risks associated with the widespread adoption of mobile technologies by developing sound BYOD strategies.[7] They are adopting device encryption and two-factor authentication, as well as using Mobile Device Management (MDM) solutions to wipe out corporate data on devices if they are lost or stolen.[8]

CLOUD COMPUTING DRIVES BUSINESS AGILITY

According to the study, 53 percent of respondents said that the cloud's ability to deliver flexible capacity as needed is the technology's leading benefit, followed by 50 percent of respondents who said that increased business agility was its main benefit. Forty-three percent pointed to lower fixed costs from using cloud-based solutions as its key benefit. Figure 4

Going forward, cloud computing is primed to have a powerful impact on businesses in 2015. More than three-fifths (62 percent) of respondents say cloud will transform their businesses in the next 12 months, up from 47 percent who say it's doing so today. It will also change the way people work, according to 56 percent of those surveyed.
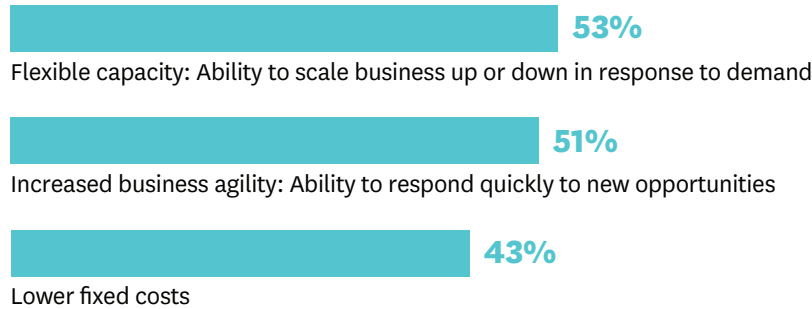
While cloud technologies have clearly had an impact on IT departments, companies are doing more with them than revamping IT operations. "We're beyond the first generation of cloud transformation, which was just facilitating the move from capital to operating expense. Now we're looking at ways in which we can more easily enable collaboration and deploy services in elastic fashion," offers Greenbaum.

FIGURE 4

CLOUD MAKES BUSINESS FLEXIBLE AND COST EFFECTIVE

Benefits of cloud computing

53%

Flexible capacity: Ability to scale business up or down in response to demand

51%

Increased business agility: Ability to respond quickly to new opportunities

43%

Lower fixed costs

Companies need to be agile, flexible, and fast to meet customer expectations. Cloud computing can be key to that responsiveness. "We have customers who give us 90 days to get something up and running," observes Padmanabha of Wipro. "There's no way I can do that in my traditional data center." The public cloud delivers a time-to-market advantage that's hard for enterprises to beat. "We see a lot of traction with customers who have projects that have a short window of time to deliver results," Padmanabha says.

Dr. Wu Feng, a professor of computer science, electrical & computer engineering, and health sciences at Virginia Tech, concurs that the flexible capacity of cloud-based solutions can enable dramatic increases in performance that weren't available previously. Next-generation sequencers are capable of doubling the amount of data that they generate every eight or nine months. "We're generating data faster than we can analyze it," Feng says. A cloud solution, which optimizes data management and data transfer, delivers better performance and access to DNA sequencing tools and resources, leading to faster advancements in medical research.

As with mobile, security issues and privacy concerns are the main barriers that inhibit cloud adoption. "I'm in a highly regulated business. Beyond that, I'm in a consumer-facing business where I'm accountable for the stewardship of personally identifiable customer data," says Ray Voelker, CIO of Progressive Insurance. Because encrypting data in the cloud would slow down the speed of analytics, Voelker says he's evaluating hybrid cloud solutions. "Most companies look at a hybrid environment," says Greenbaum. "They don't do everything in the cloud. But as new services and capabilities and opportunities come up, they look to do that via cloud services."

Despite some hesitation, the study identified strong support for cloud-based solutions as more than just a way to reduce IT infrastructure and personnel spending. The study found that leading companies are using the rise of public and private cloud computing to create new business models and services in addition to taking advantage of the greater cost efficiencies and scalability features that the cloud provides.

BIG DATA HELPS COMPANIES INNOVATE

The advent of new data analysis solutions such as in-memory computing, along with the ability to host many of these solutions in the cloud, is enabling enterprises to overcome the traditional barriers to big data analysis. Organizations today have the ability to process and analyze large quantities of structured and unstructured data to generate business insight in real time. With the advent of the Internet of Things (IoT)—including wearable computing, connected cars, and smart cities—the amount of data organizations have available to analyze is set to increase exponentially.[9]

Even now, just over half (54 percent) of respondents say that big data has transformed their organizations; 70 percent expect it to do so going forward. For those who master big data, the biggest payoffs are allowing the integration of more data into decision making processes (according to 62 percent) and enabling faster generation of insights (cited by 52 percent). Figure 5

However, leading companies aren't just integrating more data into their analyses; they are using the results to develop new products and services.

For example, Progressive Insurance has always collected and analyzed a significant amount of data. But Snapshot, its innovative auto insurance discount program, "has taken things to a whole new level," says Voelker. An in-car wireless device transmits driver data back to Progressive at one-second intervals. Customers can get their premiums reduced based on their safe-driving patterns, with those earning a discount saving an average of 10 percent.

Progressive has collected more than 178 terabytes of data via Snapshot—11 times the amount of all data stored by the Library of Congress. It provides for a much more accurate pricing method for Progressive than estimating a customer's potential for loss based on information like age, gender, and type of car, says Voelker. What's more, it has enabled an entirely new and successful product category—usage-based auto insurance. "It's revolutionary to us," says Voelker. "Every time we find a more powerful segmentation variable, it drives more growth."
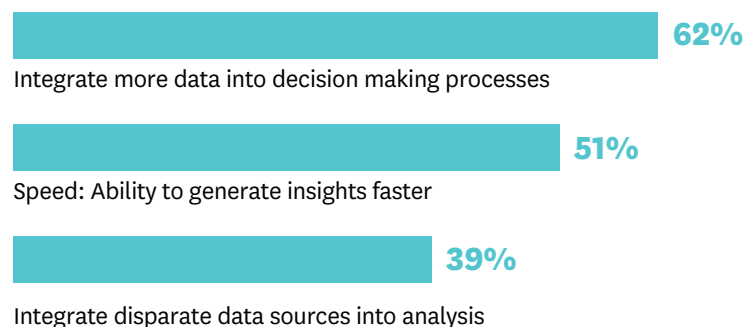
Another example of a leading organization using big data to innovate comes from Auckland Transport, New Zealand's public transport agency. The agency analyzes four terabytes of

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FIGURE 5

BIG DATA IMPROVES ANALYSIS FOR DECISION MAKING

Benefits of using big data

62%
Integrate more data into decision making processes

51%
Speed: Ability to generate insights faster

39%
Integrate disparate data sources into analysis

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operational data, including bus ridership, to discover the most popular routes, identify routes to expand, and improve the customer experience. "It's a substantial undertaking," says Roger Jones, Auckland Transport's manager of IT and business systems. "We have to figure out how to transform that data to information and then make that information relevant to the customer."

In the future, Auckland Transport plans to analyze images from around the city to understand where traffic congestion occurs or to assist with public safety. Ultimately, the agency will deliver personalized alerts to citizens letting them know their bus is running late or that there's increased traffic on their usual route to work.

Despite the promise of big data, however, it remains hard to manage, hard to interpret, and hard to integrate into day-to-day business operations and decision making. Further, success doesn't happen overnight. "The companies that are good at [big data] have been working on it for quite a while," says Thomas H. Davenport, professor of IT and Management at Babson College and author of *Big Data @ Work*. Davenport points out that one of the earliest users of business analytics—UPS—has been working on telematics to track its packages and delivery trucks for 25 years but only recently announced plans for analytics-based dynamic routing (itself a project 10 years in development).

Further, skilled data analysts and scientists, who understand both the statistical modeling and the business applications of big data, are hard to find. Nearly half of respondents (48 percent) say that a lack of data analysis skills is the biggest barrier to big data. Even those who regard big data as a critical part of their operations find it difficult to hire the necessary talent.

Leading companies are addressing this talent shortage by hiring skilled contractors or working with consulting firms that have big data practices. Some are getting more creative. Jones, at Auckland Transport, is addressing the talent shortage by working with data scientists at local universities. "There's a wealth of opportunity for PhDs who might unearth something interesting mixing our data sets with other data sets," he explains. The department is also sponsoring a hackathon. "It's about exposing some of our data feeds so others can analyze it in ways we might not be able to internally."

Further, the study results highlight that successful organizations are those that adopt a big data mind-set. Business leaders must create a culture that embraces the intelligence big data delivers, agrees Donald A. Marchand, professor of strategy execution and information management at the International Institute for Management Development (IMD). "You have to treat bad news as good news and be willing to act on it," he says. "You need the ability to see that the way you thought about things in the past may not be productive in the future." And this point of view has to be pervasive—from the C-suite to sales and product development to the front lines.

SOCIAL TRANSFORMS CORE BUSINESS PROCESSES

According to the survey, the consulting and business services sector is the most transformed by social media—more than half of that sector's respondents indicated that they had already experienced a transformational effect from social. Early business successes with social networking are most visible in outbound marketing activities: 51 percent of respondents say that social media has increased their company's ability to effectively communicate with its customers. Figure 6

Industry experts observe that social media is becoming a core aspect of modern digital marketing strategies, and they see potential for it to radically transform the marketing function. But forward-thinking organizations are not using social networks only to listen to and better understand customer sentiment about products, brands, and companies as a whole. They are also using social technologies for recruiting and HR management, and for collaboration and communication with employees, partners and suppliers.

The survey findings indicate that social technology is positioned to have a broad impact. Survey respondents who deem social technology to be critical to their infrastructure (22 percent) are significantly more likely than their peers to say they benefit from an increased ability to innovate. Even businesses that haven't yet embraced social media anticipate its potential. More than half of all respondents say that social technology will transform their organizations (57 percent) and the way they work (58 percent) in the next few years.

Four years ago, Ask.com, a leading online brand for questions and answers, hired Eric McKirdy to improve the customer support experience and improve the support team's internal operations. By deploying a CRM application that integrates mobile social media listening capabilities, the company has transformed both. One key change in how Ask.com's customer support team works is that they can now manage support tickets, including those generated through social media, entirely by smartphone, without being tethered to a laptop or an office.
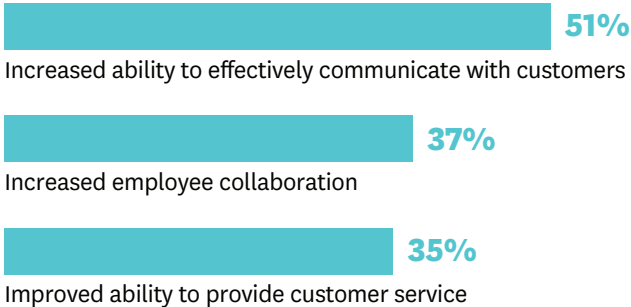
Similarly, Auckland Transport is evaluating social tools to listen and respond quickly to citizen comments and even prevent security dangers. The agency plans to mine that unstructured data, analyze it, and feed it to the operations team to respond to—and someday prevent—transportation problems. Like Ask.com, Auckland Transport eventually plans to create service requests from complaints posted on social networks, feed them into a CRM system, and manage them proactively.

Business leaders note, however, that it isn't always clear how best to incorporate social media into core business operations. Social technologies are often not integrated with core operational systems, and the data they generate is unstructured. "As far as enabling line of business transactions and being used beyond boosting marketing and the employment brand,"

FIGURE 6

SOCIAL IMPROVES COMMUNICATION AND COLLABORATION

Benefits of using social technologies

51%
Increased ability to effectively communicate with customers

37%
Increased employee collaboration

35%
Improved ability to provide customer service

says Progressive Insurance's Voelker, "it's less mature as a business tool." The main concerns survey respondents have about social technology include the time spent by employees using it (cited by 45 percent) and employee information overload (cited by 40 percent).

But leading companies are using social in their core lines of business, turning to social tools that provide a greater level of integration with their mission critical business systems. For example, McKirdy of Ask.com said the company once used a variety of social media monitoring and communication tools to identify and respond to issues. But now that Ask.com uses one social module in a cloud-based CRM system, "We monitor all major social media channels and can respond with the click of a mouse," says McKirdy.

CONCLUSION: HOW DIGITAL TRANSFORMATION HAPPENS

While it is clear that each of the four technology megatrends has had a tremendous impact independently, the study finds that deploying integrated solutions is where the greatest impact is achieved. "The most important trends, the most interesting things, are happening at the intersections of these four different technologies," asserts Babson College's Davenport. Similarly, Horrom, of the Detroit Lions, says, "There's less value to the Lions in having big data coming in if we don't have a method of compute in the cloud or on premises to interact in real time with our fans via a mobile platform."

The survey found the likelihood that organizations are being transformed to be significantly greater among those that deem multiple technologies to be critical. Among "multi-adopters"— organizations that view at least three of the megatrends as playing a critical role in operations— more than two-thirds (67 percent) report they have transformed, compared to as few as one-third (34 percent) of single adopters. Even dual-adopters (using two technologies in critical areas) are better poised to reap the benefits that sit at the nexus of these technology trends.
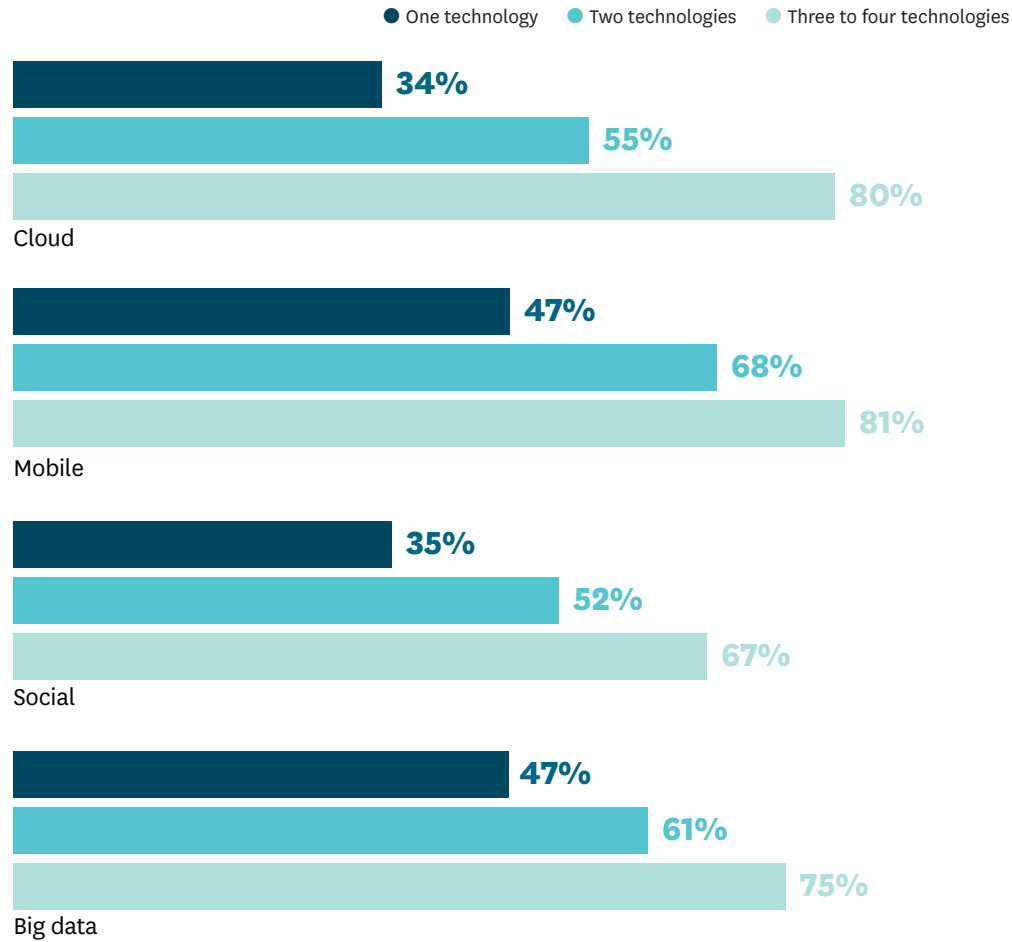Figure 7

Most importantly, the innovation and improved agility described in the examples above are not simply a result of spending more on IT. At this point in cloud, mobile, social media, and analytics development, C-level and senior line of business executives should be assessing the various business capabilities of their organizations and developing a strategy and a road map to improve and differentiate their core capabilities with these digital technologies. The firms that take advantage of the new capabilities can not only transform themselves but also achieve success in the 21st century.

"None of the changes enabled by these technologies comes without accompanying organizational changes—management mind-sets, organizational behavior, operating cultures," says Marchand of IMD. "Deep change over time coupled with these technologies is where transformation happens." ◆

FIGURE 7

MULTI-MEGATREND ADOPTION MORE LIKELY TO YIELD BENEFITS

Multi-adopters are significantly more likely to view cloud, mobile, social, and big data as having a transformational impact.

● One technology ● Two technologies ● Three to four technologies

34%
55%
80%
Cloud

47%
68%
81%
Mobile

35%
52%
67%
Social

47%
61%
75%
Big data

ENDNOTES

1   Other studies of emerging IT trends label the same four technologies variously as the "nexus of forces" (Gartner) and "the third platform" (IDC).

2   George Westerman, Didier Bonnet, and Andrew McAfee, *Leading Digital: Turning Technology into Business Transformation*, Boston: Harvard Business Review Press (2014).

3   Delta Air Lines, "Delta streamlines in-flight customer service with new windows phone handheld devices for flight attendants," August 22, 2013, http://news.delta.com/index.php?s=20295&item=124317.

4   Susan Hauser, "Customer Spotlight: Metropolitan Police Service," Microsoft Corp., June 3, 2014, http://www.microsoft.com/enterprise/susan-hauser-blog/articles/london-metropolitan-police-customer-spotlight.aspx#fbid=lIpBqiblbq.

5   Dave Neal, "Met Police to wield tablets and cameras as part of 2014 technology strategy," *The Inquirer*, February 7 2014, http://www.theinquirer.net/inquirer/news/2327666/met-police-to-wield-tablets-and-cameras-as-part-of-2014-technology-strategy.

6   For instance, Monsanto and other agriculture firms have begun to offer data-driven advice to farmers about planting and cultivation. However, they are getting resistance from farmers, who see the benefits but worry about how their data will be stored, protected, and used. See: "Digital Disruption on the Farm," *The Economist*, May 24, 2014, http://www.economist.com/news/business/21602757-managers-most-traditional-industries-distrust-promising-new-technology-digital.

7   Harvard Business Review Analytic Services, "Making BYOD Work: Balancing Productivity and Security," Harvard Business Publishing, 2014.

8   "Evolving the Connected Enterprise," CIO Strategic Marketing Services, July 2014, http://www.oracle.com/webapps/dialogue/ns/dlgwelcome.jsp?p_ext=Y&p_dlg_id=16017095&src=8078039&Act=22.

9   James Manyika, Michael Chui, Jacques Bughin, Richard Dobbs, Peter Bisson, and Alex Marrs, "Disruptive technologies: Advances that will transform life, business, and the global economy," McKinsey Global Institute, May 2013, http://www.mckinsey.com/~/media/McKinsey/dotcom/Insights percent20and percent20pubs/MGI/Research/Technology percent20and percent20Innovation/Disruptive percent20technologies/MGI_Disruptive_technologies_Full_report_May2013.ashx.

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