THE 2013 TMT VALUE CREATORS REPORT

THE GREAT SOFTWARE TRANSFORMATION

HOW TO WIN AS TECHNOLOGY CHANGES THE WORLD

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SOFTWARE HAS BEEN AN important—if often hidden—shaper of industries and consumer behaviors for several decades. But in the past decade or so, we have seen how software can fundamentally alter, disrupt, and create industries, business models, and sources of competitive advantage. Software is the thread that stitches together what we call the “digital metasystem”—a digital environment that offers the ability to mine big data and connect and engage with customers anywhere and at any time.

This software-powered digital metasystem will have far-reaching impact, crossing industry boundaries and pervading all aspects of business and society. Understanding these developments cannot be optional for management.

Companies in the technology, media, and telecommunications (TMT) industries are at the vanguard of bringing the products and services to market that will drive this cross-industry transformation. Future winners will grasp this opportunity by responding to the needs of customers, expanding to new customer groups in emerging markets, and building trust in business models that are driven by personal data. Lasting success will require much more, however. Leaders need to understand this rapidly changing landscape, and companies need to transform their mindsets, capabilities, and overall business models.

Companies that can quickly and effectively build capabilities based on software and computer intelligence into their business will gain competitive advantage. They will need to focus on innovation rates but also on overall strategy, alliances, customer-centricity, and productivity—essentially managing the transition from current business models to new ones.

In addition, engagement with policymakers and regulators will be increasingly important. Because technology is changing faster than regulation, leaders must ensure that regulatory policies are based more upon broad principles of conduct; policies must also recognize and enable innovation.

The total shareholder return of winners and losers continues to be a stark scoreboard of how well companies are managing this set of challenges. Over the past five years, the top-performing TMT companies—such as Apple, ARM, Samsung, Tencent, and Naspers—have been among the top performers across all industry sectors. The weak performers have collectively destroyed hundreds of billions of dollars of shareholder value. This contrast between winners and losers is partic-
ularly evident in the tech industry, where the pace of change is arguably the fastest. Likewise, in the media industry, a few traditional companies—such as Pearson, publisher of the Financial Times—have successfully managed cash flow in their traditional properties while building digital businesses, but most companies have struggled. And although the telecom sector includes some strong performers, a weak European economy, the end of high growth in emerging markets, and the challenge of transforming to data-centric business models have massively destroyed shareholder value.

The messages are clear. You need to be a part of the new digital metasystem. You need to understand how software is influencing your business. If you are global, you need to be entrenched in emerging markets. If you are a mature company, you need to transform your business fast while managing your legacy assets for cash flow. And because the digital and emerging-market platforms are burning hot, you do not have the luxury of taking five years to manage this evolution.

Act now.
ON THE STREETS NEAR Google’s headquarters in California, a driverless car may be stopping and starting in traffic, entering and exiting highways, avoiding runaway dogs, and even navigating the famously crooked and steep Lombard Street in San Francisco. Google’s cars have completed more than 500,000 miles of accident-free driving. At this year’s Frankfurt International Motor Show, several car manufacturers announced plans to introduce autonomous vehicles within the next decade. Vehicles such as these will change the nature of driving, transform adjacent industries such as insurance, and create new opportunities in, for example, in-car entertainment and commerce.

Such disruptive technologies are possible because five fundamental trends are coming together to create a wholly new digital environment for consumers, companies, industries, and society. This convergence is the new digital metasystem. Collectively, these forces are creating a perfect storm for companies that fail to master them and a perfect opportunity for the winners—to build new businesses, re-shape current ones, redefine the customer experience, and enhance innovation. At the heart of this metasystem is the increasing pervasiveness of software—the most widespread of the five trends—which powers and enables the other four trends and transforms the economics and business structure of everything it touches. The other four trends are affordable small devices, ubiquitous broadband connectivity, big-data analytics, and cloud computing.

Pervasive Software

It is hard to overestimate the pivotal role of software in altering a wide range of traditional ways of working. This year’s Nobel Prize in chemistry went to scientists who simulated chemical reactions using software models. Code conquers crucibles. Indeed, software is at the heart of the global economy. It controls the networks that provide the connectivity, smartphones, devices, and social media that bring users together, and it increasingly defines the user experience of these devices and services. It is also operating behind the scenes in the creation of smart energy grids, traffic management systems, and efficient global supply chains. Software is the engine that has driven many, if not most, of the most disruptive business models introduced over the past 25 years, including iTunes, Amazon.com, Google, and Netflix.

Software is enabling organizations to draw inferences from this tsunami of data from myriad sources by using nontraditional Bayesian methods, which rely on interpreting probabilities. These approaches offer major advances, ranging from improved promotion targeting to customized management of medical treatments to more effective deployment of police.
on the streets. Big-data analysis is receiving heavy investment by large and small companies, and at least five types of commercial opportunities are apparent: generating new business insights; improving core operating processes; enabling faster, better decision making; taking advantage of changing value chains; and creating new, data-centric businesses. Companies that harness this content have the ability to reshape the competitive landscape.

As IBM’s chief executive Virginia Rometty has noted, we are now in the “cognitive” era of computing—in which software can automate decision making and learn from past mistakes, not just complete routine tasks. IBM’s Watson, arguably the first computer to pass the Turing Test—that is, to exhibit human intelligence—has made a well-publicized appearance on *Jeopardy*, beating the kings of quiz, but its game-changing value likely lies in areas such as customer service, health care, and the legal profession.

Quite simply, “software is eating the world,” as Marc Andreessen, a co-founder of Netscape and venture capitalist, said two years ago. “Six decades into the computer revolution, four decades since the invention of the microprocessor, and two decades into the rise of the modern Internet, all of the technology required to transform industries through software finally works and can be widely delivered at global scale.”

### Affordable Smart Devices

Approximately 1 billion smartphones will be sold in 2013, the first year that their sales will have exceeded those of feature phones. By 2018, there will be more than 5 billion “post-PC” products—tablets and smartphones—in circulation. (See Exhibit 1.) The success of these devices largely turns on their user interface—how easy and intuitive they are to use—which is controlled by software.

More remarkably, there are already nearly as many mobile connections—6.8 billion—as there are people in the world, according to the UN’s International Telecommunication Union (ITU). Even with the double and triple counting in this figure, nearly anyone...
who wants and can afford a mobile phone has one.

Meanwhile, “wearables” such as Google Glass, Nike’s Fuelband, and Samsung’s Galaxy Gear smart watch—all software enabled—are heralding the next wave of smart consumer products. While the effect of Moore’s law has delivered computing power into the palms of so many consumers, it has also made possible myriad IP-enabled sensors and actuators—such as radio frequency identification tags, intelligent thermostats, and motion sensors—to create the “Internet of things.” Cisco predicts that, by the end of 2017, the number of IP-connected devices will be three times the global population, or more than 22 billion devices.

Ubiquitous Broadband Connectivity

By the end of 2013, as Exhibit 1 shows, almost 40 percent of the global population—or 2.7 billion people—will be using the Internet, according to the ITU. In the coming five years, 1 billion more people will go online, pushing Internet penetration to half of the global population. These will increasingly be broadband connections, improving the experience of customers and businesses. According to Akamai, a leading cloud platform, the average global fixed-broadband speed jumped nearly 10 percent in the past year, with South Korea, Japan, Switzerland, Hong Kong, Latvia, and the Netherlands each achieving average speeds in excess of 10 Mbps.

For much of the world, though, mobile will be the predominant form of broadband access. Ericsson estimates that there will be 6.8 billion mobile broadband subscriptions by 2018, roughly the same as the total number of mobile subscriptions today. One challenge will be to deliver broadband connections economically in remote areas. Google is currently experimenting with providing mobile access through high-altitude balloons.

While operators figure out the economics, they are also looking to new technologies such as so-called software-defined networks. Broadband networks today consist largely of collections of hardware—base stations, routers, and so on—that have software embedded within them. Over the next several years, these networks will be virtualized so that a layer of software will dynamically allocate spectrum and shape the wireless footprint. Broadband networks could help accelerate mobile broadband adoption by lowering capital and operating costs.

Widespread connectivity and affordable devices are bringing the “zettaflood” closer.

Ubiquitous connectivity and affordable devices are bringing the “zettaflood” closer; Cisco estimates that global IP traffic, after quadrupling in the past five years, will triple by 2017 to 1.4 zettabytes annually. Putting it another way, the gigabyte equivalent of all the movies ever made will cross the global Internet every 3 minutes. This connectivity opens opportunities to reach consumers where they live, work, shop, and play and to create fully multi-channel sales, marketing, and customer-service experiences. It enables companies to create powerful links with employees, suppliers, and partners and new ways of working within the organization and across multiple ones.

Big-Data Analytics

The rise of smart devices and global connectivity is leading to an explosion in data, now growing at 27 terabytes per second through the creation and dissemination of video, images, social-networking chatter, and transactional and other information. (See Exhibit 2.) Investments are flooding into the area.

Cloud Computing

Just as cheap microprocessors led to a shift in computing from mainframes to PCs, the relative economics of high-speed connectivity versus processing is now driving workload into the cloud. For enthusiasts of the “big exponentials,” Butter’s law is trumping Moore’s law. (See Exhibit 3.)

Cloud computing presents a new paradigm. The consumer not only has a computer in his
**EXHIBIT 2 | In 2015, More Than Half of All Data Will Have an IP Address**

- 90% of the stored data in the world today was created in the past two years
- Annual data growth rate: 40 to 60 percent
- Tweets sent per minute: 34,000
- Orders from Amazon every day: 9 million products
- Page views on Google every day: 7 billion
- Data created every day: 2.5 exabytes


**EXHIBIT 3 | Communications Is Beating Processing as a Structural Driver of Growth**

- Microprocessor transistor count (Moore’s law)
- Processing substitutes for communication
  - Innovation is centered around processing and storage, resulting in rich and heavy devices
  - V.92 56k modem (1995)
  - Apple II (1978)
  - Equal growth rates
- Communication substitutes for processing
  - Innovation is moving to mobile, social, cloud, and the "Internet of things," all of which enable big data

*Source: BCG analysis.
Note: Internet speed = average advertised download speed purchased by consumers according to the FCC (1994–2009) and OECD (2011) and estimated by CSG network prior to 1994; transistor counts are calculated according to the technology released at the end of each year by Intel, ADB, IBM, and others.*
or her hand but he or she has access to vast computing power in the cloud. It is becoming increasingly difficult to tell where intelligence and content reside: on a device or in the cloud. The cloud extends the concepts of common architecture, abundant bandwidth, and community to computing resources, and it will help spark the creation of new business models built around collaboration, networks, and information in nearly all industries.

As the cloud democratizes information technology, it provides a growth lever for entrepreneurs and small businesses. Vendors such as Amazon, Google, Microsoft, and IBM have invested billions of dollars in building computing and storage capacity that can be easily and affordably accessed. By some estimates, the cloud market could reach nearly $250 billion by 2017 as corporate clients grow more comfortable with pay-as-you-go computing.

Digital Metasystem
There have been elements of the digital metasystem in place for several years. But only recently has software begun to unify devices, connectivity, data, the cloud, and software in new and mutually reinforcing ways. The most successful large TMT players over the past five years—Apple and Samsung, two “hardware” companies energized by iOS and Android operating-system software, respectively, and Tencent, an Internet company—have taken advantage of the emerging digital metasystem to create value for their customers and shareholders. (See the sidebar “Rational Exuberance.”) As Young Sohn, Samsung Electronics’s chief strategy officer, said recently, “We make really great devices, but actually if you think of our future, it’s in answering the question of how we put it all together and how we manage the data that’s coming out of these devices and encourage the innovation ecosystem for our platforms.”

NOTE
1. Moore’s law states that the number of transistors on an integrated chip doubles every 18 months. Butters’ law says that the throughput of fiber-optic cable doubles every nine months.
THE COLLECTIVE IMPACT OF the five trends described above is nothing short of revolutionary, affecting almost every area of business and society. While the first 15 years or so of the Internet era were characterized mostly by the Internet’s disruption of what might be called “discretionary industries”—music, shopping, travel—it’s now beginning to disrupt nondiscretionary industries such as health, education, banking, government, telecommunications, and manufacturing.

The early days of the Internet made it simpler for businesses to manage the struggle over “richness versus reach”—or customization versus scale—but the commercial solutions were largely one-way: Amazon.com selling the long tail of books, for example. Social media, however, introduced interactivity and two-way conversation, dialogue, and participation. Now we are moving to an even denser, deeper, data-rich phase. The consequences are profound.

Better Value for Consumers
Digital technologies can fundamentally improve lifestyles and quality of life through services ranging from augmented reality, remote health care, enhanced retail experiences, and smart homes. This is a phenomenon not just for mature markets but also for emerging markets, where nearly one-third of all smartphone sales now occur. Mobile apps such as Peek, an ophthalmologic diagnostic tool, are revolutionizing health care in remote regions of emerging markets. In India, which has a relatively undeveloped digital economy, online activities such as product research and price comparisons are shaping the preferences of Indian consumers, influencing what they buy and why. This influence affects up to five times more purchases than those actually made online.

Of India’s 90 million urban Internet users, 40 percent report that their online activities influence what they buy. In terms of financial impact, this digital influence affects $30 billion of consumer spending in India today, as much as five times more than e-commerce alone. With growing access and use in India, this digital impact is expected to grow fivefold to $150 billion by 2016—more than the combined revenues of the major retail chains (estimated at $106 billion) and 20 percent of the total retail market (estimated at $799 billion). (See Exhibit 4.)

Growth and Efficiency
The convergence of the five trends is helping companies of all sizes to power growth and streamline organizations and operations. BCG recently surveyed more than 4,000 small and medium-size enterprises (SMEs) in five countries—the U.S., Brazil, China, Germany, and India. (See Ahead of the Curve: Lessons on Technology and Growth from Small-Business Leaders,
The survey showed that technology leaders increased annual revenues 15 percentage points faster than did companies with lower levels of technology adoption. Technology enabled them to collaborate more effectively internally and externally, scale operations faster, operate more efficiently, and innovate and experiment more strategically. They also created jobs almost twice as fast as other SMEs. (See Exhibit 5.)

Even ad agencies, which are deep into digital, online, and mobile advertising on behalf of their clients, can benefit from smarter use of technology. We researched the causes of the inefficiencies that agencies encounter and how they limit effective use of agency time. What we discovered is that 80 percent of employee time—four days out of five—is devoted to heavily manual, low- or no-value tasks, such as formatting reports and entering data, as well as significant amounts of rework.

Fortunately, there are solutions. Agencies can achieve quick improvements in efficiency of up to 12 percent by implementing a unified technology platform that provides a single-user interface, allows for data sourcing from a single pool, and eliminates the need to reconcile, consolidate, and transfer data from multiple sources. But just taking this step is, by itself, insufficient for capturing the full value of efficiency gains in the digital world. Companies that undertake a comprehensive approach involving integrated tools and processes realize staff time savings of up to 33 percent in their campaign operations.

One consequence of the new digital metasystem is that all companies are effectively tech companies. Companies cannot thrive in today’s world without embracing technology, not just to improve existing processes but also to reimagine their core business. The Internet of things and the industrial Internet, sometimes called Industry 4.0, is in the sights of the likes of Cisco’s John Chambers and General Electric’s Jeff Immelt. Chambers sees $14 trillion in potential profits up for grabs as all companies become connected. They can improve the efficiency of existing business models, create new ones, and use big data to create new sources of competitive advantage. Immelt describes how Internet technologies and big data are radically changing GE’s medical-equipment and aircraft-engine businesses, pointing out that even a 1 percent improvement in operations from big data will lead to great savings for their customers.

A quick scan of business headlines reveals how quickly this is already happening. Insur-
ers are adjusting premiums based on real-time driving habits of customers who agree to have sensors placed in their cars. Patients with chronic diseases are wearing devices that monitor and help to manage their conditions. Software and sensors are helping cities monitor, manage, and reroute traffic during peak times. (For other examples, see Exhibit 6.)

Shifting Industry Borders

The digital ecosystem is fundamentally disrupting the economics of major industries and shifting the boundaries between them. At least five different forms of disruption and reshaping are occurring in these industries:

- **New Playbooks.** When Amazon.com entered the book business, it was competing directly with booksellers and eventually put many of them out of business. In creating Google Wallet, Google is less interested in generating the transaction fees that motivate banks than in broadening its relationship with customers.

- **New Alliances.** TMT companies are increasingly entering alliances with companies from industries—such as health care—that are far afield from their core business and have far different operating methods, business models, and talent profiles. Japanese telecom NTT Docomo has teamed up with Omron Healthcare to launch a mobile health-care venture that allows consumers to upload personal data from blood pressure cuffs, sleep monitors, and weight and body-fat scales to the cloud via smartphones. Docomo expects to almost double revenues from such adjacent businesses to $11 billion by 2015.

- **New Architectures.** Fundamentally new industry structures are forming. Many industries—from health care to telecommunications to power utilities—are moving away from vertical integration to a “stacked” architecture. Stacks are a modular, layered, and open architecture, with each layer containing a related set of activities and allowing active competition among companies. Lower layers of the stack tend to be asset intensive, and higher layers are built around software and user participation. This layered structure helps fuel innovation and improves adaptability.
**New Business Models.** Big data and the Internet of things—two intertwined phenomena—are building new opportunities to create value. For example, when sensors are embedded in the everyday world, such as in streets and buildings, once intractable challenges such as traffic management become easier to master.

**New Challenges.** Many of these same opportunities, however, create challenges for traditional companies. Car insurance policies based on actual driving patterns, for example, create complex pricing dilemmas: is speeding more or less risky than making rapid lane changes?

### Societal Impact

The convergence of technologies has the potential to improve people’s quality of life and livelihoods. This is most evident in emerging markets, where consumers with mobile phones have access to information that can improve their earning potential and access to health and entertainment. Nations such as Brazil, Chile, China, India, South Africa, and Turkey have fewer than two doctors per 1,000 people, compared with an average of 3.1 in the OECD nations. Technology can help overcome these shortages. The Mobile Alliance for Maternal Action is a public-private partnership that supplies expectant mothers with health and wellness tips delivered by text message and tailored to local cultural norms. Trials have been taking place in Bangladesh, India, and South Africa, where every year more than 4,000 women die during pregnancy or childbirth and where 20,000 babies are stillborn.

In all markets, adjacent technologies can work together to generate societal benefits. Medical researchers are combining cognitive computing with big-data analytics in order to diagnose medical conditions and discover treatments and cures. In India, more than 450 million people now have unique identification numbers that initially are being used to distribute social benefits. Supporters of the biometric identification system, known as Aadhaar, believe it could eventually become the backbone of a range of online services, including financial services, health care, and telecommunications. Likewise, education is ripe for new approaches.
Connectivity and computing are starting to revolutionize education, a discipline that has changed little since Aristotle. In particular, massive open online courses (MOOCs) have recently exponentially expanded the nature and reach of higher education. Courses can offer opportunities for interactivity and testing and can also expand participation to older, more remote students as well as lower-income groups. Coursera, founded by Stanford University computer-science professors and funded by Kleiner Perkins Caufield & Byers, has teamed up with dozens of leading universities around the globe to offer more than 500 online courses to more than 5 million students. But while some prestigious universities say it is nonsense to see MOOCs as a rival, others see the disruptive nature of the opportunity and are forging ahead, recognizing that MOOCs are much more than good university lectures available online.
The digital metasystem has already delivered tremendous value and benefit, but the future potential is even bigger. Challenges abound, however, and all companies will encounter many hurdles as they wrestle with this new and fast-moving environment.

Achieving Customer-Centricity
Satisfying consumers is never easy, but it is especially challenging in the TMT sector. A device may have great technology, features, and value, for example, but consumers will reject it if they do not find the user interface to be intuitive. Over the next decade, three key challenges will confront TMT companies: serving consumers in emerging markets, appealing to the baby boom, or silver generation, and resolving longstanding tensions involving the use of personal data.

Winning in Emerging Markets. Emerging markets present several challenges for TMT companies, notably distribution, competition from local companies, and rapid infrastructure growth.

- **Distribution.** One of the fiercest business battles will be for the billions of people joining the middle class in emerging markets—a group that will make up 30 percent of the global population by 2020. Today there are about 700 emerging-market cities with populations of more than half a million—and only 240 such cities in the West. In the next 20 years, there will be more new cities created in emerging markets than exist today in the West. Every week, 1.2 million people move to these cities.

- **Competition.** TMT companies will increasingly be competing against local companies that likely have a better understanding of consumer preferences for devices, content, and services. Xiaomi, for example, became a leading Chinese
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smartphone company in just a few years and is already valued at $10 billion. Shenzhen-based Huawei is the number one telecom-equipment maker and the number three mobile-phone manufacturer globally.

- **Infrastructure.** As these new cities emerge, consumers and companies will increasingly be demanding advanced digital services to facilitate traffic movement, energy management, and advanced connectivity. The construction of these cities will require enlightened private-public partnerships, multiple alliances, and a willingness to take risks and innovate.

**Serving the Silver Market.** As the baby boom ages, the senior market will account for 40 to 60 percent of consumption in some mature markets, with the global spending power of consumers aged 60 and older hitting $15 trillion by the end of this decade, almost double what it was in 2010. According to Nielsen, roughly half of the U.S. adult population will be 50 and older by 2017 and will control a full 70 percent of the overall population’s disposable income. Stereotypes can be dangerous, though. Many consumers in this group may still be in their prime: continuing their education, working in new careers, and maintaining active lives. An increasing share will be digitally active, too: BCG research shows not only that women over 55 spend 17 percent more time online than younger women do but also that they value the Internet more highly, using it to keep in touch with distant friends and families, share photos, participate in MOOCs, and get good online-shopping deals. And as they age and become infirm, technology can help maintain or improve the quality of life.

Winners will recognize the size of the prize that this broad group represents, segment the opportunities carefully—perhaps by financial position, health, interests, and retirement objectives—and tailor their products and services to their customers’ needs.

**Personal Data and Trust.** Personal data can create new economic value by helping to achieve new efficiencies in business and to tailor and personalize products. Personal data play a critical role in the development of the Internet economy and have been key in the recent valuations of companies, such as Google and Facebook, that collect and utilize personal data.

There is a risk, however, that this value will not be realized. High-profile security-data breaches are commonplace. Surveillance activities by the U.S. and other governments are giving individuals even more justification to be concerned about intrusions into their privacy and the possibility of data being used for purposes of which they do not approve. Companies are sometimes unclear about what they can do with personal data. Current regulations are inconsistent and confusing, and many governments are unclear as to how they can protect privacy while also encouraging innovation and growth. It is not hard to imagine a “data shock” scenario, analogous to the oil price shock of four decades ago, that leads to restrictions on the flow and use of data and, consequently, reduced growth of data-driven business models.

There is a risk that the value promised by personal data will not be realized.

The notion of consent, well engrained in these discussions, sheds light on the complexity of the topic. Think of all the “I agree” boxes you see online. It’s an important priority, given how much of our lives is now digitally transcribed. And the growth of personal data shows no sign of slowing. But the prevailing notice-and-consent approach is not working. It fails to give people any understanding of, or genuine control over, how their information will be used. It’s a binary choice—yes or no. It does little to build trust or engage the individual, and it threatens to constrict the flow of data. While notice and consent may seem like the most prudent approach, it could end up taking a significant toll, mainly in the form of missed opportunities.

All companies, but especially TMT companies, need new rules about what they can
and cannot do with personal data. They must be complex enough to encompass the extensive and diverse ways in which data can be used and flexible enough to adapt to the new uses of data that are being invented almost daily. The rules that lay out the legitimate uses of data need to balance the potential value that personal data can unlock with the rights of individuals and societies. There needs to be a coordinated yet decentralized approach to this global challenge.

Recent BCG research shows that consumers are willing to allow the use of personal data for multiple purposes if, and only if, organizations are careful stewards of this information. Only 7 percent of consumers report that they are comfortable with their information being used outside of the purpose for which it was originally gathered. However, 54 percent indicated comfort with sharing if they believed that the uses would not embarrass them, damage their interests, or otherwise harm them. But opinions vary by country, which will complicate efforts to provide global coordination. (See Exhibit 7.)

Making the Economics Work

Even though the TMT sector has arguably benefited from startups and entrepreneurialism more than any other sector, many parts of it still require heavy investments and global scale to succeed. For example, Google’s capital spending increased to more than $2 billion in the third quarter of 2013—nearly 50 percent more than in the second quarter and nearly three times more than in the third quarter of 2012. Telecom operators regularly invest 10 to 15 percent of their revenues in their network. In certain parts of the digital metasystem, that is what it takes to win. In others, success will require smaller, more strategic bets.

Capital Constraints. The explosive growth in digital-services traffic, often provided by companies such as Netflix and YouTube, is a

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**EXHIBIT 7 | Preventing Harmful Uses Can Increase Access to Consumer Data by at Least Five Times in Most Countries**

<table>
<thead>
<tr>
<th>Country</th>
<th>Disagree</th>
<th>Strongly disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
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<td>4</td>
<td>52%</td>
<td>2</td>
</tr>
<tr>
<td>Canada</td>
<td>58%</td>
<td>4</td>
<td>59%</td>
<td>2</td>
</tr>
<tr>
<td>Australia</td>
<td>57%</td>
<td>4</td>
<td>66%</td>
<td>3</td>
</tr>
<tr>
<td>U.K.</td>
<td>57%</td>
<td>4</td>
<td>66%</td>
<td>3</td>
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<td>Germany</td>
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<td>66%</td>
<td>3</td>
</tr>
<tr>
<td>France</td>
<td>62%</td>
<td>6</td>
<td>72%</td>
<td>3</td>
</tr>
<tr>
<td>Italy</td>
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<td>6</td>
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<td>Spain</td>
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</tr>
<tr>
<td>India</td>
<td>13%</td>
<td>2</td>
<td>57%</td>
<td>2</td>
</tr>
</tbody>
</table>

Change in willingness to share data (percentage points)

50 48 56 57 62 62 69 22 -1 47 50

“Data should only be used by a company for the purpose for which it was collected”

“"If I had the ability to prevent the harmful uses of data, I would be more willing to let companies use data about me"


Note: The exhibit shows survey responses that are comparable. Percentage point changes reflect the difference between the numbers shown; some numbers have been adjusted for rounding.
challenge for all network operators. Video streamed from Netflix and YouTube is already responsible for more than 50 percent of fixed-line bandwidth in the U.S. As these services are increasingly consumed on the go, the demand for mobile broadband capacity is exploding too, pushing operators to make significant network upgrades.

These investment challenges currently reveal themselves most prominently in European telecom companies. Mobile infrastructure investments in Europe will have fallen 67 percent between 2004 and 2014. (See Exhibit 8.) European operators are spending half as much on 4G networks on a per subscriber basis as are their peers in the U.S. and Japan. Less than 1 percent of mobile connections in Europe at the end of 2012 were 4G, compared with 11 percent in the U.S. and 28 percent in South Korea, the global leader. European operators are also slow in their fiber investment.

Mobile data usage is increasing everywhere, but in Europe it’s growing more slowly than in the U.S. and, more important, carriers there are having difficulty making money from mobile services. (See Exhibit 9.) Revenues are growing much more slowly than traffic. This makes the business case for investment in 4G networks harder to justify.

Just as Germany’s energy companies are confronting the so-called Energiewende, the “energy turn” from nuclear and fossil fuels to renewable sources of energy, telecom companies in many parts of the world face what we might term Datenwende, a difficult shift to business models that are based on IP networks and data services.

Transformation of legacy networks to software-defined networks will probably help solve this problem, but this transition will take several years. In the meantime, consolidation of the fragmented European telecom landscape and harmonization of spectrum allocation are essential. The sector will also benefit from increased partnering between telecom operators and the providers of digital services, as well as new approaches to pricing. Finally, European stakeholders, including both public- and private-sector participants,

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**EXHIBIT 8 | Mobile Infrastructure Investments Have Dropped Significantly in Europe**

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Sources: Gartner; IE Market Research; BCG analysis.
Note: Western Europe includes the EU-15 plus Switzerland and Norway. Calculations include investments in base stations and core infrastructure equipment.
need to take a fresh approach to regulation rather than try to build on the current fractured foundation.

Operators in emerging markets face a different capital challenge from those in Europe. Subscriber growth is healthy, but subscribers are not generating value. About one-fifth of customers generate nearly two-thirds of the revenue of operators in emerging markets. This imbalance undermines the case for large-scale investment in new networks. Operators need a new playbook for generating revenue in order to support the case for investment. Alternatively, creative public-private partnerships and public funding might make sense to pay for advanced digital infrastructure. To encourage competition, a condition of public funding should be an open architecture higher in the stack.

**Smart Bets.** To stretch their capabilities and move into new businesses, TMT companies will likely have to invest in, partner with, or acquire companies operating on the bleeding edge of the digital ecosystem. To understand the focus of investments by venture capitalists and corporate investors in big data and wireless technologies—two areas critical to the development of the digital metasystem—we leveraged big data itself and drew on Silicon Valley’s Quid.

The company tracks emerging tech trends by creating interactive visual maps based on information from patent applications, research papers, news articles, financial documents, and other content. Quid has been recognized as one of the world’s most innovative companies. To understand where the money is going, we worked with Quid to analyze more than 1,100 companies active in big data and more than 400 companies active in wireless networks and technology—all of which were private at some time between July 2012 and August 2013.

The analysis created a visual map of activity in different “communities,” or clusters of companies, grouped into broader themes such as enterprise data or analytic tools. (See

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**EXHIBIT 9 | European Operators Have Not Been Able to Monetize Mobile Data**

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Average revenue per user per month ($)</th>
<th>Data usage/subscriber (MB)</th>
<th>Average price per MB ($)</th>
</tr>
</thead>
</table>

**Sources:** Ovum; Ericsson; BCG analysis.

**Note:** Western Europe includes the EU-15 plus Switzerland and Norway. Percentage changes are compound annual growth rates.
Exhibit 10.) The visualization showed a concentration of big-data investments in consumer data and marketing, with close to 300 venture-funded companies.

Analyzing these big-data communities and themes led to the following insights:

- Private investments accounted for one-fifth of the total sum. There were five initial public offerings.
- After the U.S., the U.K., China, and Israel had the highest number of venture-funded companies.
- Enterprise data is a much more established theme, with close to 40 percent of the companies going public or being acquired during the period.
- The data platform theme is the most investment-intensive, with a median private investment of $10 million, compared with $5 million to $6 million in the other themes.
- Sequoia Capital, Lightspeed Venture Partners, Accel Partners, and Andreessen Horowitz have made the broadest set of investments in the big-data sector, with salesforce.com, Cisco, and Intel the largest corporate investors.

Quid conducted a similar exercise involving wireless networks and technologies in order to understand how companies are addressing the rapid increase in the amount of data traffic and impending spectrum constraints. (See Exhibit 11.) This analysis revealed themes such as wireless hardware and infrastructure and led to the following insights:

- After the U.S., the U.K. and Israel had the highest number of venture-funded companies.
- Wireless hardware and infrastructure is attracting more new companies than the other themes—with close to half of the companies identified as active in this area.
- The biggest growth area is access point links and small cells, attracting more than $170 million in investments.
- Cisco has made three significant acquisitions in this space: Ubiquisys, based in the U.K. and a leading provider of intelligent 3G and long-term evolution (LTE) small-cell technologies; Meraki, a provider of cloud-based Wi-Fi, switching, security, and mobile-device management; and Israel-based Intucell, a provider of advanced self-optimizing network (SON) software, which enables mobile carriers to plan, configure, manage, optimize, and heal
cellular networks automatically, according to real-time, changing network demands. These moves reflect Cisco’s increased push into mobile technologies and software.

- Sequoia Capital, Lightspeed Venture Partners, and Matrix Partners have made the largest investments in the sector, with Cisco, Intel, Vodafone, and Deutsche Telekom among the biggest corporate investors.

Creating New Business Models
The digital-services ecosystem could reach $1 trillion by 2015. For that to happen, several industries will need to come together to cooperate, and individual companies will have to develop new playbooks. All kinds of companies are participating in the digital metasystem: telecom operators, software developers, data and analytics companies, and companies from traditional industries, such as General Electric.

Three main models are emerging to take advantage of the new digital metasystem: we call them collaborative, competitive, and “greenfield.” The choice of model is heavily influenced by location, but all TMT companies should be thinking about how they want to compete, cooperate, and participate in the digital economy.

Collaborative. This model tends to be operator-centric. Japan has a business culture rooted in cooperation, and its industries are the leading exemplars. Two decades ago, consumers flocked to new services such as mobile e-mail, contactless payments, and, in time, streaming live video, all of which were aggressively developed and marketed by Docomo, with its “i-mode” ecosystem, and by its largest competitors, KDDI and SoftBank Mobile. Fixed-rate data plans helped facilitate uptake. Today, 95 percent of users are on fast 3G networks (4G is also taking hold), and mobile phones are Japan’s most widely owned device.

Thanks in part to aggressive dealmaking by Docomo and others, traditional industries in Japan began to “go mobile” years ago. Take mobile payments. Docomo pioneered this technological innovation, leveraged local market dynamics, and achieved critical mass through partnerships with established players (often industry leaders). The success of mobile ticketing for rail service helped seal deals.
in the finance, retail, and hospitality sectors, among others. More than 500,000 merchants now participate in Docomo’s mobile payment service.

**Competitive.** This model is most evident in the U.S., which has a wide-open mobile economy with low barriers to entry, particularly at the upper layers of the stack. Between them, the Apple App Store and Google Play have created thousands of application entrepreneurs. U.S. consumers are happy to embrace the kind of creative destruction at which the Internet and mobile excel, hastening the demise of old business models and enthusiastically welcoming new ones, so long as they are easy to adopt and show clear value. U.S. businesses, including small and medium-size enterprises, are quick to try new technologies that promise to increase sales, decrease costs, and open new markets. Even the smallest local retailer or restaurant can use location-enhanced advertising. Many larger companies are using mobile applications across the enterprise, driven in part by employees bringing their mobile devices to work and showing how the enhanced connectivity and portability can improve operations.

The TMT sector is experiencing tremendous growth and shrinkage simultaneously.

Nonetheless, it is the collaborative rather than the competitive model that has led to greater penetration of capabilities (such as mobile payments) and the development of functions (such as streaming live video in Japan). In the U.S. and other countries, apps and services that require collaboration among multiple providers—mobile payments is one example—run into a “frenemy” issue. While many companies see mobile’s potential, they also fear that competitors will use it to invade their turf. In addition, no compelling consumer or retail proposition for mobile payments has emerged, such as mobile ticketing in Japan, despite plenty of activity around “mobile wallets” and other apps. Perhaps credit cards still work fine in most situations, or companies have not figured out how to capture the value of transactional data and come up with compelling offers that are built on big data.

**Greenfield.** The third model is unfolding in many rapidly developing economies. In India, the phrase paisa vasool—the art of the possible—could be used to describe this model. India is also a compelling example of the creativity and entrepreneurialism that can define a largely unencumbered mobile ecosystem. The market there suffers from limited 3G and Wi-Fi connectivity. Nonetheless, strong competition among 2G operators has driven tariffs down and mobile penetration up. This has led to the creation of an ecosystem of value-added services built around slower 2G networks and less sophisticated feature phones that are still providing users with a wide array of services. Many Indians use their devices for entertainment and information and are now starting to make use of them for basic financial activities such as bill payment. Matrimonial matchmaking and astrology sites are highly popular. Farmers use mobile phones to check commodity prices. Mobile banking took hold earlier in India than it has in the U.S. and Europe. Building on this success, India’s challenge now is to make the transition to a world of smartphones and 3G/4G networks.

**Transforming Minds and Capabilities**

The TMT sector is experiencing tremendous growth and shrinkage simultaneously. Market valuations are volatile. New competitors and investors are on the prowl, and new sources of competitive advantage, especially relating to software, are forming. This mix creates challenges for traditional TMT companies. They need to change the way they look at their businesses and the capabilities they require.

**Change in Mindset.** In order to generate value in the future, established TMT companies need to both manage mature businesses and pursue growth aggressively. In other words, they need to “walk backward slowly” and “run forward fast.” For many companies, this dual focus is a challenge. Today, too
many companies, cautious about the future, are playing it safe—focusing on the bottom line and managing for cash. But while it might be tempting to wait for the dust to settle or for conditions to improve, the challenges that make today’s business environment so challenging are not temporary. They are the new status quo.

This is a tricky business. If companies fail to harvest, reform, or sell their legacy businesses, they will be left with a lump of devalued assets and dwindling cash. But they could also destroy their credibility with shareholders by entering businesses where they have not earned the right to play. For traditional hardware companies, the transition to businesses built around software and services will be especially challenging since the skill set, time horizon, and culture tend to be starkly different.

For traditional hardware companies, the transition to software is challenging.

At the same time, executives will need to make their companies more agile and adaptive, responding swiftly to market opportunities, experimenting, perhaps allowing ideas to percolate up from the field, accepting failure, and allowing customer-centric innovation to flourish. Classic strategic planning is still relevant but must be supplemented by a more flexible way of preparing for the future.

In the end, companies that fail to invest for growth will lose, often to new competitors unburdened by legacy business models and brimming with confidence. Even for the most established companies, it is essential to understand the growth imperative. Opportunities abound almost everywhere, and they must be seized. If you don’t do so, someone else will.

Change in Capabilities. To win in this new competitive environment, leaders need to develop new talent and capabilities. It starts at the top. Leaders must set the direction, ensuring that the board and executive team have sufficient understanding of the rapidly changing market dynamics and technology and know how to drive rapid change.

New leadership skills are required. In particular, leaders must be able to navigate through this kaleidoscopic environment. They need to convey purpose and direction but also be willing to make midcourse corrections. They need analytical skills, as always, but also the ability to discern and translate signals and make decisions on the basis of both experience and imperfect information about the future. Leaders also need to be willing to self-correct. They must question the status quo, be willing to reexamine the environment, and correct outdated modes of leadership. It is tricky to balance this questioning stance with the confidence that leaders need to convey. Finally, leaders need to broaden their view of success in a world of greater government involvement, globalization, and interconnections. Their success will increasingly depend on other parties rather than occurring in a vacuum.

Best-practice companies have sophisticated approaches to keep abreast of technology practices, customer adoption, and behavior. They also use the adaptive processes to drive faster, more insightful approaches to innovation and to manage the shifting skills profiles required for their workforce—more data and software engineers, for example.

Today, many TMT players are data rich but information poor. They have access to amazing amounts of data about their customers, markets, and operations but barely tap into this wealth of information. Those companies that develop better capabilities to integrate data-driven insights into their business will have a strong advantage over competitors.

Creating a New Regulatory Regime
TMT regulation is often a highly rule-based regime focused on the prohibition of specific activities by specific companies. Given the fluid nature of the digital economy, regulation should be based upon broad principles of conduct that apply across industries and
that recognize the need for innovation. Senior company executives need to be more active in shaping the new regulatory framework. This work is too important to be left to public-policy executives and lobbyists alone. Executives will gain more in the long run by creating the conditions for future growth and prosperity than by protecting legacy businesses.

There are at least four areas in which executives and regulators can work together to improve the current setup:

- **Global Regulation.** Consumers are increasingly gaining access to global networks, content, and services. Regulators continue to operate within national boundaries, and international collaboration on issues such as data security, privacy concerns, and intellectual property is difficult to achieve. European telecom operators, for example, have stricter regulations regarding personal data than global Internet companies do—even though they are in some ways competitors.

- **Multilayered Regulation.** Businesses within the digital-metasystem stack have varying business models, return horizons, and competitive landscapes. A standard policy will be restrictive and retrograde. Regulators should define different policies and norms for different layers of the stack. At the infrastructure layer, regulators should encourage consolidation and scale, while higher up in the stack they should promote dynamic regulations as new models to accommodate innovation.

- **Market-Based Regulation.** Technology evolves far faster than the regulation meant to guide it. Governments can respond to this mismatch by creating adaptive regulatory systems, enacting laws based on principles—for example, that consumers have a right to keep certain personal data private—and giving authority to third parties to apply those principles to changing market conditions. For issues such as privacy and copyright, this can be accomplished through formal and informal judicial processes. For issues such as technology and content standards, industry bodies can take the lead, often with government as a partner.

- **Integrated Regulation.** The impact of the digital metasystem can be felt across industry boundaries. Smart cities need collaboration among technology and infrastructure companies, and smart health-care systems need collaboration among health care providers, payers, and TMT companies.

Countries should aim to create a merged regulator—the U.K.’s Ofcom is one example—that is not politicized, is authorized to make decisions, is able to respond quickly to changing market dynamics, is staffed by experts with relevant experience throughout both the private and public sectors, and is funded to compete with industry for talent.

A similar approach should be considered for government departments. This is far from simple: Internet policy touches every aspect of broader government policy, including business, culture, education, and health. Several core functions, however—including telecommunications, media, and Internet policy—are candidates for merger or consolidation within an existing department or ministry. At the very least, some formal arrangement for coordination should be pursued.

These are critical issues, not just for companies but for countries, too. Without successful resolution of them, society will not receive the full benefit promised by the new digital metasystem. If investments in networks fail to keep pace, a digital divide could emerge, with the less fortunate members of society unable to fully participate in digital activities. The pace of innovation could slow if companies manage for cash rather than growth. And the balance of power may shift to fewer, larger companies, potentially slowing innovation and discouraging entrepreneurship.
Over the past five years, the majority of TMT companies that have created the most value for shareholders have taken advantage of either the explosive growth of emerging markets or the rise of the new software-enabled digital metasystem, or both. (See Appendix for details.)

Six of the top ten media TSR performers, for example, have a major presence in emerging markets, as do the top two telecom performers. In the tech industry, three of the top ten are direct beneficiaries of the adoption of smartphones—ARM Holdings, Apple, and Samsung—while two of the top media companies—Tencent and Baidu—are digital natives.

Of the top ten companies in each of our three industries for the five years preceding the start of the post-PC era (from 2003 to 2007), only four—Apple, Naspers, American Tower, and Crown Castle—remain on the top-ten lists today. The first has defined the post-PC era, the second has grown on the basis of digital media in emerging markets, and the last two have benefited from the offloading of assets by traditional telecom companies. None is in any way a “traditional” company; all have disrupted or benefited from industry megatrends.

Success, thus, is often fleeting, and volatility is increasing.

Of course, it’s hard to make predictions, especially about the future. But given the expected pace of change, it is highly likely that the list of top performers five years from now will be very different from today’s. Disruptive companies are likely to play prominent roles and, as the Internet spreads to the “next billion” consumers and disposable income rises in these markets, the share of top performers based in or with significant activities in emerging markets is likely to be quite a bit higher than the current dozen or so of our top 30.

Some future winners will be those making speculative “leaping forward” bets on new technologies or markets (See the sidebar “A Checklist to Prepare for the Future.”) Most others will have excelled at managing their mature businesses (the slow walk backward) while moving swiftly to grasp new opportunities (the fast run forward). The specifics will clearly vary by industry sector and will include efficiency measures, portfolio transformation, consolidation moves (in European telecom companies, for example), and the use of digital channels and big data to improve customer service and engagement.

The winners will also have established “digital DNA” in their organizations by having taken these steps:

- **People Practices.** They will have taken a hard look at their board and executive team to see if they have been sufficiently savvy about all things digital and the role
The Great Software Transformation

They will have had experience in managing rapid transformations. They will have focused explicitly on change management capabilities and quickly developed the skills base of the workforce, including bringing on more software specialists and data scientists. They will have established teams with digital talent in the best locations worldwide.

- **Management Practices.** They will have asked whether the strategic-planning process is adaptive and able to receive weak signals from customers, partners, and other participants in the market. Being adaptive does not mean focusing on the short term; the best strategic-planning processes must also address megatrends, such as the rising importance of software, and their consequences, as well as disruptive technologies and their potential to erode existing business models.

They will have made a serious commitment to digital pursuits along the entire main sequence of the value chain. They won’t have tinkered with “skunk works” teams but will have been serious about digital channels, big data, productivity-enhancing technology, and collaboration.

- **Innovation Practices.** They will have reviewed the innovation process and made it faster and more customer-centric, while also pursuing blue-sky bets. They will have adopted techniques such as “scrum” and “agile” for software development.

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**A CHECKLIST TO PREPARE FOR THE FUTURE**

Not all of these suggestions will fit all companies or industries; pick and choose those that apply. Shorter-term priorities might include the following:

- Capture opportunities in emerging markets.

- Develop products and value propositions that will win gold in the silver market.

- Develop value from data in order to improve operations, innovate, and grow.

- Build trust regarding the gathering and use of personal data.

- Use digital platforms to cut costs and improve engagement and quality in customer interactions.

- Take advantage of opportunities in the media industry to sell goods and services across multiple delivery platforms.

- Create the next killer device category—it may be a watch, glasses, an implantable device, or a related application.

Consider the following when focusing on longer-term priorities:

- Build alternative models for network infrastructure based on software-defined networks and more effective access technologies.

- Define ecosystems to monetize the Internet of things by working closely with those industries most likely to benefit from this new phenomenon.

- Create new businesses that relate to connected cities, connected networks, and autonomous vehicles.

- Create new human-computer interfaces—beyond touch and beyond voice?

- Build connected, 3D-printing ecosystems.

- Create new models of education by leveraging advances in cognitive science, health care by leveraging genomics and value-based health care, and new models of government by reforming service delivery and leveraging open data.

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of technology. They will have had experience in managing rapid transformations.

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They will have identified and invested in, or partnered with, relevant startups and built a corporate unit dedicated to scanning for such opportunities.

- **Value Creation.** They will have determined where, in the next three to five years, the large, new profit pools are likely to be, and they will have committed serious resources to business development, alliances, partnerships, and networking.

They will have put a focus on cash generation in stagnant or declining businesses and will have clear plans for the slow walk back from these activities.

- **External Relations.** They will have invested in investor relations and in explaining the digital-transformation story so that the share price reflects the company’s aims.

They will have engaged with policymakers, governments, and regulators to ensure the creation of an environment of innovation, growth, and job creation, as well as the societal acceptance of the new technology paradigm.

**This** is a long list; time is running short. Future winners must get moving now.
This report builds on the fifteenth annual Value Creators report published by The Boston Consulting Group. It ranks the stock market performance of the top technology, media, and telecommunications (TMT) companies over five years, from 2008 through 2012.

Of the 191 TMT companies analyzed, 76 are from the technology industry, 62 from the media industry, and 53 from the telecom industry. To be ranked, companies needed to have been publicly listed for all five years, with at least 25 percent of their shares publicly traded. We also imposed a minimum market capitalization of $8 billion for technology and telecom companies and $3 billion for media companies.

The overall rankings track performance in local currency from 2008 through 2012. For companies that are listed in exchanges outside their home country, returns were calculated in the currency of the exchange.

In addition, we show the contributions of the four components of total shareholder return (TSR) in order to assess how each company creates value. The first two elements—sales growth and change in profit margin—represent a company’s fundamental value. The third element—the change in multiple—conveys investor perception of the company. We calculated the multiple as the ratio of the combined market value of equity and debt to EBITDA. All three elements contribute to establishing the change in a company’s market capitalization. The last element combines cash dividends, share repurchases, and debt repayments in order to determine the contribution of cash payouts to a company’s TSR.

In 2008, when the five years covered by this data begin, Twitter and Android were in their infancy, and Apple’s App Store opened with 500 applications. There were about 4 billion mobile phone and device subscriptions—nearly 3 billion fewer than today. Sina Weibo, the Chinese microblogging service, had not yet been born; today, more than 500 million users post 100 million messages on the site each day.

That brief historical sketch makes clear the challenge of reviewing trends in the TMT sector over periods any longer than the gestation period of a baboon—about half a year. Even so, there is value in looking backward for lessons and clues suggesting a path or range of paths forward.

Among the 25 industries analyzed, the media industry rose from ninth place to sixth, with a 7 percent annual TSR. The tech industry, with a 4 percent annual TSR, fell from sixth to twelfth place. The bottom dropped from the telecom sector, which fell from sixth to twenty-fourth place. (See Appendix Exhibit 1.) With a –2 percent annual TSR, the telecom industry bested only the metals industry’s –11 percent TSR in the five-year rank-
ings. (To put these numbers in perspective, the average annual TSR for all 1,616 companies in BCG’s study was about 4 percent.)

The five-year period captured in this report includes performance during 2008, a year of financial meltdown and tumult. Those five years were especially brutal for poor-performing tech companies that had not adapted to the post-PC era. During the recovery, media companies fared better than tech and telecom companies.

**APPENDIX EXHIBIT 1 | Media and Tech Generated Gains, but Telecom Companies Performed Worse Than Most Industries Did**

<table>
<thead>
<tr>
<th>Total Sample</th>
<th>Value creation</th>
<th>Fundamental value</th>
<th>Top 10</th>
<th>Valuation multiple</th>
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<td>TSR (%)</td>
<td>Sales growth (%)</td>
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</table>

**Sources:** Thomson Reuters Datastream and Worldscope; Bloomberg; annual reports; BCG analysis.

**Note:** The five-year average annual TSR (2008–2012) is expressed as a weighted average of respective samples. TSR disaggregation is shown in percentage points of five-year average annual TSR. EBITDA is used to calculate the valuation multiple. Cash flow contribution is the combination of dividend yield, change in shares outstanding, and change in net debt. Numbers may not add up to the totals shown owing to rounding. In banking and insurance industries, several adjustments were made. Equity growth was used rather than sales growth. Change in return on equity was used for margin change for banks. No comparable metric exists for insurers. For banks and insurers, P/E multiples and price-to-book multiples were used, respectively, rather than EBITDA. Cash flow contribution combines dividend yield, changes in number of shares outstanding, and change in debt levels. Change in net debt levels was also not available for banking and insurance industries. For the media industry, the TSR is shown for the top eight companies because Starz and Discovery had incomplete data.
Industry averages mute the strong performance of individual companies. The top ten performers within the TMT sector did considerably better than the industry average. (See Appendix Exhibit 2.) (Overall, the average TSR of the top ten companies in each industry outpaced their industry averages by between 11 percentage points in insurance and 32 percentage points in pharmaceuticals.)

Several TMT companies made the list of top ten large-capitalization TSR performers. Among 137 companies with market capitalizations exceeding $50 billion, Tencent was number one, with an annual TSR of 33.8 percent, up one spot from the previous rankings; Samsung broke into the top ten in fourth place, with an annual TSR of 23.4 percent; and Apple was sixth, with an annual TSR of 22.1 percent, down three spots.

With its tablet and cloud businesses, Amazon.com is a technology company masquerading as a retailer. It came in seventh overall among all large-cap companies with an annual TSR of 22.0 percent. The five-year success of Tencent, Samsung, Apple, and Amazon.com in generating value for their shareholders stems directly from their success in taking advantage of the digital metasystem that we describe in the body of this report.

Only four tech, four telecom, and three media companies from the previous year’s ranking maintained a place in the top ten. Five-year rankings generally smooth out annual fluctuations, so this reshuffling is especially noteworthy. (The tech companies that also appeared in the prior 2007 through 2011 rankings are ARM Holdings, Apple, salesforce.com, and Cerner; the media companies are Baidu, Tencent, and Naspers; and the telecom companies are DiGi Telecommunications, Advanced Info Service, Taiwan Mobile, and American Tower. More on these companies later.)

The big TSR losers in all three TMT industries were companies that have failed to transform their business models. Appendix Exhibit 3 shows the range in the four components that make up TSR performance. In each industry, all but one of the top ten performers exceeded the industry average for sales growth. In other words, companies cannot shrink and restructure their way to strong

**APPENDIX EXHIBIT 2 | The Top Ten Companies Significantly Outperformed the Average in All Sectors**

![Graphs showing top ten companies and average performance across Technology, Media, and Telecommunications](image)

Sources: Thomson Reuters Datastream and Worldscope; Bloomberg; annual reports; BCG analysis.

Note: Media top ten TSR index does not include Starz and Discovery.
TSR performance. They need to grow. Top media and telecom performers got support from positive changes in valuation multiples, and technology got a boost from margins. Dividends also helped the top media stocks. Industry breakdowns follow.

**Technology**

As mentioned earlier, Apple and Samsung were two of the most successful large-cap value creators in the rankings. Two other big tech winners were Catamaran, a software and service company focused on the health industry, and ARM Holdings, which designs low-power chips for phones, tablets, and other mobile devices. Software, IT services, and semiconductor companies did particularly well: Catamaran is one of six software and IT-services providers and ARM is one of two semiconductor companies on the top-ten list. (See Appendix Exhibit 4.)

The technology industry as a whole experienced declining sales growth and a contraction in multiples over the five-year period. Sales growth, for example, contributed 9 percentage points of TSR from 2006 through 2010 but only 5 percentage points from 2008 through 2012. The tech industry, of course, is actually composed of many subindustries whose performance varies widely. The seven consumer-device companies and the 22 software and IT-services companies generated an average annual TSR of 7 percent over the five years. Both subindustries benefited from sales growth and improving margins. Several other subindustries fared far less well. Computer hardware companies in the sample, victims of slow sales and contracting multiples, generated –7 percent annual TSR. Telecom-equipment, IT system, and office equipment suppliers also generated negative returns as rising R&D costs and price pressures took their toll.

**Media**

Six of the top ten media performers are focused on emerging markets, compared with four of the top ten last year. (See Appendix
Exhibit 5.) Tencent, a Chinese social-media company; Naspers, a diversified South African media company with a large stake in Tencent and a presence across Africa, Latin America, and Eastern Europe; Media Nusantara Citra, an Indonesian media company; and Baidu, a Chinese online search and Web company, all reported annual TSR exceeding 20 percent, compared with the industry average of 7 percent. Tencent and Baidu, in particular, have generated TSR through growth and despite margin contraction. Indeed, sales growth is largely what distinguishes media companies from emerging and mature markets.

Nearly all of the top media performers have been engaged in M&A and other transactions meant to adapt to the changing landscape. The number one media value creator, for example, was Starz, a U.S. premium cable and satellite channel that, during the five-year period, acted as a holding company for a wide variety of ever-changing media and entertainment assets. (Starz was spun off from Liberty Media in early 2013.) The company generated an annual TSR of 48 percent from 2008 through 2012. During that time, a series of restructuring moves and changes in capital structure led to the creation of a pure-play programming entity. In 2013, through September 30, Starz returned 112 percent.

Telecommunications

The telecommunications industry is in a tough place, in both mature and emerging markets. The sample’s –2 percent annual TSR would have been even worse without the contribution of 5 percentage points from dividend payouts. (See Appendix Exhibit 6.) In particular, the telecom operators that have generated impressive TSR have received a strong boost from dividends. DiGi Telecommunications, Advanced Info Service, and Taiwan Mobile, all top-ten telecom performers, each generated annual TSR of at least 20 percent by relying on dividend yields of about 10 percent.

Without a major shift in industry fundamentals, these payouts to shareholders will be unsustainable for many companies. Nine of the 44 telecom operators for which data are avail-

### APPENDIX EXHIBIT 4 | Software and IT Services Dominate the Top Ten Tech Performers

<table>
<thead>
<tr>
<th>Company</th>
<th>Location</th>
<th>Segment</th>
<th>Annualized five-year TSR (%)</th>
<th>Market value $billions</th>
<th>Sales growth (%)</th>
<th>Margin change (%)</th>
<th>Multiple change (%)</th>
<th>Dividend yield (%)</th>
<th>Share change (%)</th>
<th>Net debt change (%)</th>
<th>2013 TSR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Catamaran</td>
<td>Canada</td>
<td>Software and IT services</td>
<td>66.6</td>
<td>9.7</td>
<td>154</td>
<td>–72</td>
<td>9</td>
<td>0</td>
<td>–16</td>
<td>–8</td>
</tr>
<tr>
<td>2</td>
<td>ARM Holdings</td>
<td>United Kingdom</td>
<td>Semiconductors</td>
<td>45.7</td>
<td>17.0</td>
<td>17</td>
<td>10</td>
<td>17</td>
<td>2</td>
<td>–1</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>Samsung Electronics</td>
<td>South Korea</td>
<td>Consumer devices</td>
<td>23.4</td>
<td>188.1</td>
<td>17</td>
<td>–1</td>
<td>7</td>
<td>1</td>
<td>–1</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Cerner</td>
<td>United States</td>
<td>Software and IT services</td>
<td>22.4</td>
<td>6.7</td>
<td>12</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>–1</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Apple</td>
<td>United States</td>
<td>Consumer devices</td>
<td>22.1</td>
<td>499.8</td>
<td>45</td>
<td>21</td>
<td>–46</td>
<td>0</td>
<td>–1</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>salesforce.com</td>
<td>United States</td>
<td>Software and IT services</td>
<td>21.8</td>
<td>24.6</td>
<td>32</td>
<td>–8</td>
<td>2</td>
<td>0</td>
<td>–4</td>
<td>–1</td>
</tr>
<tr>
<td>7</td>
<td>Tata Consultancy Services</td>
<td>India</td>
<td>Software and IT services</td>
<td>20.8</td>
<td>44.9</td>
<td>23</td>
<td>3</td>
<td>–8</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>Red Hat</td>
<td>United States</td>
<td>Software and IT services</td>
<td>20.5</td>
<td>10.2</td>
<td>21</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>–1</td>
</tr>
<tr>
<td>9</td>
<td>ASML Holding</td>
<td>Netherlands</td>
<td>Semiconductor equipment</td>
<td>18.0</td>
<td>26.0</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Teradata</td>
<td>United States</td>
<td>Software and IT services</td>
<td>17.7</td>
<td>10.3</td>
<td>9</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Top ten</td>
<td></td>
<td></td>
<td></td>
<td>22.6</td>
<td>843.9</td>
<td>27</td>
<td>8</td>
<td>–15</td>
<td>1</td>
<td>–1</td>
<td>2</td>
</tr>
<tr>
<td>Total sample (% companies)</td>
<td></td>
<td></td>
<td></td>
<td>3.6</td>
<td>2,828.2</td>
<td>5</td>
<td>3</td>
<td>–8</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Sources: Thomson Reuters Datastream and Worldscope; Bloomberg; annual reports; BCG analysis.

Note: The contribution of each factor is shown in percentage points of five-year average annual TSR. Numbers may not add up to the totals shown owing to rounding.

1 As of December 31, 2012.

2 As of September 30, 2013.
able had dividend payouts that exceed earnings. Twelve of the 44 companies are also earning less than the estimated cost of capital. (See Appendix Exhibit 7.) The challenges will not get easier as operators are forced to upgrade their networks to provide high-bandwidth digital services. Over the past ten years, operators in emerging markets have increased their debt load at a 9 percent annual rate; in mature markets, the annual increase is 2 percent. Like dividend payments, this rising debt load will become increasingly difficult to manage without stronger revenue growth than most telecom operators have experienced over the past five years.

Small companies dominated the top-ten telecom list. Their collective market capitalization of $160 billion is only about one-third larger than Verizon’s or Vodafone’s. An analysis of the top ten telecom companies with market capitalizations exceeding $25 billion presents a far different picture. The annual TSR of these companies is 6.1 percent, compared with 16 percent for the overall top ten. Dividends contributed a 5 percentage point kick to both top-ten large-cap and overall top-ten value creators. (See Appendix Exhibit 8.)

The list of the top ten large-cap telecom companies also highlights the revenue challenge of operators. With the exception of American Tower, Telefónica Brasil, and MTN Group, the latter two both based in emerging markets, none of the companies experienced annual sales growth above 5 percent.

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**APPENDIX EXHIBIT 5 | Emerging Markets Rule the Media Top Ten**

<table>
<thead>
<tr>
<th>Company</th>
<th>Location</th>
<th>Segment</th>
<th>Annualized five-year TSR (%)</th>
<th>Market value1 ($billions)</th>
<th>Sales growth (%)</th>
<th>Margin change (%)</th>
<th>Multiple change (%)</th>
<th>Dividend yield (%)</th>
<th>Share change (%)</th>
<th>Net debt change (%)</th>
<th>2013 TSR2 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Starz</td>
<td>United States</td>
<td>Broadcast and entertainment</td>
<td>48.0</td>
<td>13.9</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>0</td>
<td>–1</td>
<td>0</td>
<td>112</td>
</tr>
<tr>
<td>2 Tencent Holdings</td>
<td>Hong Kong</td>
<td>Internet</td>
<td>33.8</td>
<td>59.5</td>
<td>63</td>
<td>–5</td>
<td>–24</td>
<td>1</td>
<td>–1</td>
<td>0</td>
<td>64</td>
</tr>
<tr>
<td>3 Naspers</td>
<td>South Africa</td>
<td>Broadcast and entertainment</td>
<td>28.4</td>
<td>23.7</td>
<td>16</td>
<td>–8</td>
<td>19</td>
<td>1</td>
<td>–1</td>
<td>1</td>
<td>72</td>
</tr>
<tr>
<td>4 Media Nusantara Citra</td>
<td>Indonesia</td>
<td>Broadcast and entertainment</td>
<td>27.8</td>
<td>3.6</td>
<td>17</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>5 Time Warner Cable</td>
<td>United States</td>
<td>Broadcast and entertainment</td>
<td>26.3</td>
<td>28.9</td>
<td>6</td>
<td>0</td>
<td>–1</td>
<td>22</td>
<td>2</td>
<td>–3</td>
<td>17</td>
</tr>
<tr>
<td>6 BEC World</td>
<td>Thailand</td>
<td>Broadcast and entertainment</td>
<td>26.0</td>
<td>4.8</td>
<td>14</td>
<td>–2</td>
<td>8</td>
<td>6</td>
<td>0</td>
<td>–1</td>
<td>–17</td>
</tr>
<tr>
<td>7 Discovery</td>
<td>United States</td>
<td>Broadcast and entertainment</td>
<td>22.1</td>
<td>19.3</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>0</td>
<td>–2</td>
<td>–4</td>
<td>33</td>
</tr>
<tr>
<td>8 Baidu</td>
<td>China</td>
<td>Internet</td>
<td>20.8</td>
<td>35.1</td>
<td>66</td>
<td>10</td>
<td>–57</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>55</td>
</tr>
<tr>
<td>9 Global Mediacom</td>
<td>Indonesia</td>
<td>Broadcast and entertainment</td>
<td>19.0</td>
<td>3.4</td>
<td>14</td>
<td>5</td>
<td>–4</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>–19</td>
</tr>
<tr>
<td>10 Aegis</td>
<td>United Kingdom</td>
<td>Media agencies</td>
<td>17.9</td>
<td>4.4</td>
<td>2</td>
<td>4</td>
<td>11</td>
<td>2</td>
<td>–3</td>
<td>2</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Top ten</strong></td>
<td></td>
<td></td>
<td><strong>25.5</strong></td>
<td><strong>163.5</strong></td>
<td><strong>13</strong></td>
<td><strong>1</strong></td>
<td><strong>5</strong></td>
<td><strong>5</strong></td>
<td><strong>–1</strong></td>
<td><strong>2</strong></td>
<td><strong>49</strong></td>
</tr>
<tr>
<td><strong>Total sample (62 companies)</strong></td>
<td></td>
<td></td>
<td>7.2</td>
<td>1,133.9</td>
<td>5</td>
<td>0</td>
<td>–3</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>33</td>
</tr>
</tbody>
</table>

**Sources:** Thomson Reuters Datastream and Worldscope; Bloomberg; annual reports; BCG analysis.

**Note:** The contribution of each factor is shown in percentage points of five-year average annual TSR. Numbers may not add up to the totals shown owing to rounding. Top-ten data do not include Starz and Discovery because disaggregation for those companies was unavailable. 2013 TSR is not available for Aegis because it was delisted after being acquired by Dentsu. NA = not available.

1As of December 31, 2012.
2As of September 30, 2013.
### APPENDIX EXHIBIT 6 | Dividends Prop Up Meager Telecom TSR

<table>
<thead>
<tr>
<th>Company</th>
<th>Location</th>
<th>Segment</th>
<th>Annualized five-year TSR (%)</th>
<th>Market value (billions)</th>
<th>Sales growth (%)</th>
<th>Margin change (%)</th>
<th>Multiple change (%)</th>
<th>Dividend yield (%)</th>
<th>Share change (%)</th>
<th>Net debt change (%)</th>
<th>2013 TSR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Advanced Info Service</td>
<td>Thailand</td>
<td>Mobile</td>
<td>28.2</td>
<td>20.8</td>
<td>5</td>
<td>1</td>
<td>8</td>
<td>11</td>
<td>0</td>
<td>1</td>
<td>28</td>
</tr>
<tr>
<td>2 DiGi Telecommunications</td>
<td>Malaysia</td>
<td>Mobile</td>
<td>25.0</td>
<td>13.6</td>
<td>8</td>
<td>-1</td>
<td>11</td>
<td>9</td>
<td>-1</td>
<td>0</td>
<td>-6</td>
</tr>
<tr>
<td>3 Taiwan Mobile</td>
<td>Taiwan</td>
<td>Mobile</td>
<td>19.8</td>
<td>9.9</td>
<td>6</td>
<td>-10</td>
<td>14</td>
<td>9</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>4 Virgin Media</td>
<td>United States</td>
<td>Mobile/ixed line</td>
<td>17.8</td>
<td>9.9</td>
<td>6</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>6 NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 SBA Communications</td>
<td>United States</td>
<td>Mobile infrastructure</td>
<td>16.0</td>
<td>9.0</td>
<td>19</td>
<td>5</td>
<td>-4</td>
<td>0</td>
<td>-3</td>
<td>-1</td>
<td>13</td>
</tr>
<tr>
<td>6 FarEasTone</td>
<td>Taiwan</td>
<td>Mobile/ixed line</td>
<td>15.5</td>
<td>8.3</td>
<td>9</td>
<td>-7</td>
<td>6</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>7 American Tower</td>
<td>United States</td>
<td>Mobile infrastructure</td>
<td>13.1</td>
<td>30.5</td>
<td>15</td>
<td>-1</td>
<td>-1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-3</td>
</tr>
<tr>
<td>8 Iliad</td>
<td>France</td>
<td>Mobile/ixed line</td>
<td>12.6</td>
<td>10.0</td>
<td>21</td>
<td>-5</td>
<td>0</td>
<td>1</td>
<td>-1</td>
<td>-2</td>
<td>33</td>
</tr>
<tr>
<td>9 Telefónica Brasil</td>
<td>Brazil</td>
<td>Mobile/ixed line</td>
<td>11.8</td>
<td>27.0</td>
<td>18</td>
<td>-3</td>
<td>-1</td>
<td>10</td>
<td>-15</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>10 Crown Castle Interna</td>
<td>United States</td>
<td>Mobile infrastructure</td>
<td>11.6</td>
<td>21.2</td>
<td>12</td>
<td>6</td>
<td>-5</td>
<td>0</td>
<td>-1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Top ten</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total sample (53 companies)</td>
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<td></td>
<td>-1.5</td>
<td>1,889.2</td>
<td>3</td>
<td>-2</td>
<td>-5</td>
<td>5</td>
<td>0</td>
<td>-3</td>
<td>16</td>
</tr>
</tbody>
</table>

**Sources:** Thomson Reuters Datastream and Worldscope; Bloomberg; annual reports; BCG analysis.

**Note:** The contribution of each factor is shown in percentage points of five-year average annual TSR. 2013 TSR was not available for Virgin Media because it was delisted after being acquired by Liberty Global. Numbers may not add up to the totals shown owing to rounding. NA = not available.

1As of December 31, 2012.

2As of September 30, 2013.

### APPENDIX EXHIBIT 7 | Several Telecom Companies Are Struggling to Earn the Cost of Capital

![Graph showing return on invested capital and dividend payout ratio](image)

**Sources:** Thomson Reuters Datastream; BCG analysis.

**Note:** Data available for 18 developing-market companies and 26 developed-market companies.
### APPENDIX EXHIBIT 8 | Large-Cap Telecom Companies Rely on Dividends

<table>
<thead>
<tr>
<th>Company</th>
<th>Location</th>
<th>Industry Segment</th>
<th>Annualized five-year TSR (%)</th>
<th>Market value(^1) ($billions)</th>
<th>Sales growth (%)</th>
<th>Margin change (%)</th>
<th>Multiple change (%)</th>
<th>Dividend yield (%)</th>
<th>Share change (%)</th>
<th>Net debt change (%)</th>
<th>2013 TSR(^2) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Tower</td>
<td>United States</td>
<td>Mobile infrastructure</td>
<td>13.1</td>
<td>30.5</td>
<td>15</td>
<td>–1</td>
<td>–1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>–3</td>
</tr>
<tr>
<td>Telefónica Brasil</td>
<td>Brazil</td>
<td>Mobile/fixed line</td>
<td>11.8</td>
<td>27.0</td>
<td>18</td>
<td>–3</td>
<td>–1</td>
<td>10</td>
<td>–15</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Chunghwa Telecom</td>
<td>Taiwan</td>
<td>Mobile/fixed line</td>
<td>11.2</td>
<td>25.3</td>
<td>0</td>
<td>–5</td>
<td>10</td>
<td>8</td>
<td>0</td>
<td>–2</td>
<td>6</td>
</tr>
<tr>
<td>MTN Group Ltd</td>
<td>South Africa</td>
<td>Mobile</td>
<td>10.2</td>
<td>37.5</td>
<td>13</td>
<td>–1</td>
<td>–7</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>Telstra</td>
<td>Australia</td>
<td>Mobile/fixed line</td>
<td>7.1</td>
<td>57.5</td>
<td>1</td>
<td>–1</td>
<td>–3</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>Verizon Communications</td>
<td>United States</td>
<td>Mobile/fixed line</td>
<td>7.0</td>
<td>123.7</td>
<td>4</td>
<td>–5</td>
<td>5</td>
<td>6</td>
<td>0</td>
<td>–3</td>
<td>11</td>
</tr>
<tr>
<td>SoftBank</td>
<td>Japan</td>
<td>Mobile</td>
<td>7.0</td>
<td>42.3</td>
<td>3</td>
<td>11</td>
<td>–10</td>
<td>1</td>
<td>–2</td>
<td>4</td>
<td>118</td>
</tr>
<tr>
<td>BCE</td>
<td>Canada</td>
<td>Mobile/fixed line</td>
<td>6.6</td>
<td>33.5</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>1</td>
<td>–3</td>
<td>7</td>
</tr>
<tr>
<td>Vodafone Group</td>
<td>United Kingdom</td>
<td>Mobile</td>
<td>2.3</td>
<td>120.9</td>
<td>5</td>
<td>–4</td>
<td>–4</td>
<td>6</td>
<td>2</td>
<td>–2</td>
<td>45</td>
</tr>
<tr>
<td>BT Group</td>
<td>United Kingdom</td>
<td>Mobile/fixed line</td>
<td>1.8</td>
<td>29.2</td>
<td>–3</td>
<td>3</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>–4</td>
<td>51</td>
</tr>
<tr>
<td>Top ten</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total sample (23 companies)</td>
<td></td>
<td></td>
<td>–1.7</td>
<td>1,459.3</td>
<td>3</td>
<td>–2</td>
<td>–5</td>
<td>5</td>
<td>1</td>
<td>–2</td>
<td>18</td>
</tr>
</tbody>
</table>

**Sources:** Thomson Reuters Datastream and Worldscope; Bloomberg; annual reports; BCG analysis.

**Note:** The contribution of each factor is shown in percentage points of five-year average annual TSR. Numbers may not add up to the totals shown owing to rounding. Market cap for large-cap companies is more than $25 billion.

\(^1\)As of December 31, 2012.

\(^2\)As of September 30 2013.
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NOTE TO THE READER

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Acknowledgments
This report would not have been possible without the efforts of BCG colleagues Karishma Bhalla, John Corwin, Philippe Dehillion, Kerstin Hobelsberger, Christian Nill, Björn Röber, Rushabh Shah, and Sahithya Vemana. In addition, the authors are indebted to Wolfgang Bock, Jeff Bowden, Guy Gilliland, Antonella Mei-Pochtler, Naoki Ota, Devesh Raj, Vaishali Rastogi, and Sowmyanarayan Sampath, all members of the global leadership team of BCG’s Technology, Media & Telecommunications practice, as well as to numerous colleagues for their support and guidance.

The authors would like to thank Quid Inc. for the insights its software generated and that were included in this report. Quid provides a big-data software application to inform strategic decisions. The company is based in San Francisco and has 50 employees; its clients include Samsung Electronics, Microsoft, and NASA. The Quid capability was developed and customized in 2013 for BCG clients.

The authors also would also like to thank David Duffy and Mark Voorhees for their writing assistance, as well as Katherine Andrews, Gary Callahan, Sarah Davis, Abigail Garland, Kim Friedman, Amanda Provost, and Sara Strassenreiter for their help in editing, design, production, and distribution.

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