



Powering a connected world

**Disruptive technologies barometer:
Telecommunications sector**



KPMG International

kpmg.com/TMTbarometer

Foreword

It's no exaggeration to say that the telecommunications sector is undergoing a revolution. In a severely disrupted environment, the main players face the dual challenge of providing fast, secure and reliable networks to power an increasingly digital, connected world, while avoiding becoming mere commodity providers.

For virtually every sector that telecom companies serve, data has become the critical asset and platforms the new source of competitive advantage. Cloud and mobile are no longer differentiators; rather they are operational necessities. As they race to build out 5G networks, telcos must satisfy rising consumer expectations for customer service and 24/7 connectivity, as well as cope with sector convergence and competition from inside and outside of the industry.

Disruption may be a threat to the established telecom order, but it also opens up opportunities to power a new breed of digital powerhouse. To discover how telcos are investing in and embracing disruptive technologies, KPMG commissioned

Forrester Consulting to survey 580 senior telecommunications decision-makers from around the world. Our study reveals they are eager to use disruptive technologies to improve their companies' products and services, reduce costs and outpace their rivals. However, leaders are also concerned that disruptive technologies are undermining their business models and fear their businesses lack the organizational flexibility and agility to get the most out of new technology.

So how can telecom leaders make the best bets when approaching disruptive technologies? Based on our findings, we have created a framework that gauges the impact of disruptive technology investments on telecom operations and business models to help determine which technologies to adopt and when.

We would like to thank all the participants for their help in compiling this study. If you would like more information on our findings and how disruptive technologies will impact your organization, please contact us.



Peter Mercieca
Global Chair
Media & Telecommunications
KPMG International



Bob Hayward
Principal, Management Consulting
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Highlights

We surveyed 580 senior executives at telecommunications companies from 16 countries. Respondents represented a cross-section of the industry and the questions covered the key disruptive technology adoption trends, the impacts of these technologies on their businesses and their investment strategies.

1. Telcos lack a clear roadmap for dealing with disruption

The telecom executives taking part in this survey expressed loud and clear the uncertainty sweeping across the sector. In an increasingly connected world, they're worried about becoming 'dumb pipes' and fear that new players could usurp their traditional dominance as network providers. Even though many telcos have openly expressed their plans to move into internet and content-related markets, only 11 percent feel strongly their organizations have a clear strategy and mission for managing disruption and four-fifths are worried they don't have the capabilities to take advantage of opportunities in key areas such as over-the-top (OTT).

2. Telcos are strongly customer-focused in their use of disruptive technologies

As the main players strive to enhance the customer experience, they're keen to exploit the possibilities of the internet of things (IoT), wearables and data & analytics (D&A) by tracking user behavior, adapting to needs and demands in real time and sharpening their marketing. They also recognize the potential of disruptive technologies to enhance their operations — in particular to drive productivity.

However, there's considerable room for improvement. As they take on the big media players, telcos will need to maximize use of their large customer databases, employing advanced

data analytics to ensure they provide a superlative experience. Networks are another major concern. In an age in which everything is connected, outages can cause havoc as well as harming telcos' reputations. Preventive maintenance is a critical capability to keep networks running 24/7 and ensure IoT remains a vital tool for remote monitoring, servicing and repairs. Yet, only 30 percent of the sector's senior executives believe IoT is helping to improve quality, suggesting that many companies are missing a golden opportunity.

3. Telcos are hedging their bets on disruptive technologies

The sector is investing in a number of 'sunrise' technologies, such as IoT, virtual and augmented reality (VR/AR), artificial intelligence (AI) and digital currencies. However, the sheer breadth of these and other disruptive technology investments suggest they're less clear on which innovations are likely to be game-changing, although IoT, digital payments and AI appear to be having relatively greater impact at present.

4. Telcos need to take steps to adapt to disruptive technologies

Networks, platforms, equipment and people all need to align with the chosen strategy, whether it's the customer, business-to-business, internet and/or content or simply a carrier. The traditional organizational model of large teams of customer-facing staff and network engineers is changing and 78 percent of telecom leaders fear their businesses lack the organizational flexibility and agility to adapt to new ways of working. Just 8 percent strongly agree that their company has the right skills in place to embrace disruptive technologies.

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Disruption is the new normal for telecommunications

Connectivity, competition and convergence are redefining every aspect of the telecom sector, from the way networks are designed, built and maintained, to the content flowing through and, ultimately, the channels that enable users to access services.



Before long, everyone and everything will be connected, creating an explosion in network traffic, a rapid increase in the number of connected devices and telecom companies racing to upgrade their networks to 5G in an effort to provide the necessary speed and bandwidth.

Telecom companies may be accustomed to change, but the accelerated speed of disruption is something they haven't

experienced before and many are struggling to figure out how to navigate the numerous disruptive technologies and the impacts they will have on their organization.

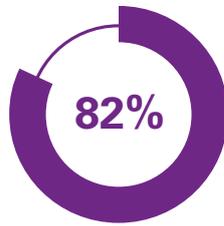
While 58 percent of telecom leaders are optimistic about the opportunities disruptive technologies provide, they also have many concerns about the impacts of these technologies on their business.

Key concerns about the impact of disruptive technologies

"Thinking about the potential impact of disruptive technologies on your business in the future, how concerned are you with the following issues?" (Somewhat to extremely concerned)



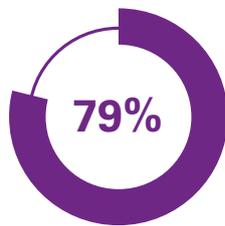
Understanding what our customers value and will pay for in an age of disruptive technologies



Our core operating model is changing due to disruptive technologies



Demand for over-the-top/OTT (where one or more services are offered across all IP networks) is outpacing the ability of telecom companies to adapt



Many new technologies treat telecom as just a 'fat pipe of bits' leaving us as commodity players



We lack flexibility and organizational agility

Base: 580 business and IT decision-makers at telecommunications companies
Source: A commissioned study conducted by Forrester Consulting on behalf of KPMG, January 2016



We've moved from a fixed analog handpiece to a full blown computer in your pocket, with an operating system and complete android/iOS-based ecosystem. The way these devices connect to the network, with the power of chips and storage, is putting huge demands on telecommunications providers to increase speed and bandwidth. The big question is: can they embrace disruptive technologies like IoT and fog computing to provide this functionality — or will a competitor get there first?



Bob Hayward

Principal, Management Consulting, KPMG in Singapore

Telecom companies are all too aware of the dangers of being left behind: a large majority (79 percent) of the respondents are concerned that their organizations are seen as just a 'fat pipe of bits', sidelining them as commodity players.

Almost four out of five respondents (79 percent) fear that that demand for OTT is outpacing the ability of telecom companies to adapt. Netflix, Microsoft (Skype), Facebook (Messenger, WhatsApp), Amazon, Tencent (WeChat), PayPal, Google and many other firms are all expanding their services in this space and, in the process, consuming a significant proportion of available network bandwidth. The insatiable demand for content by consumers, and telcos' need to differentiate themselves, is pressuring operators to invest heavily in increasing network capacity. However, this is creating a vicious cycle, with much of this capacity being further exploited by OTT players rather than the telcos themselves.

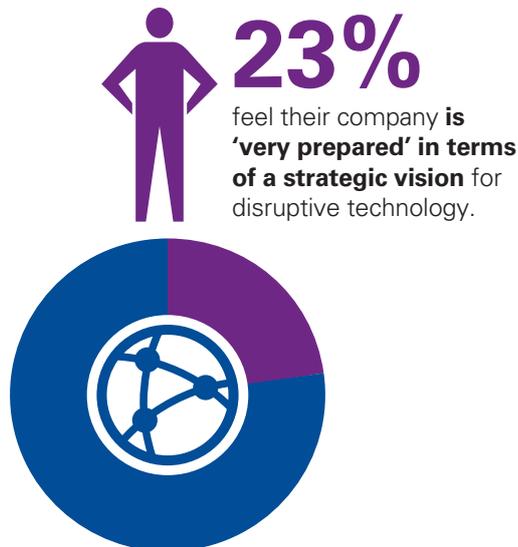
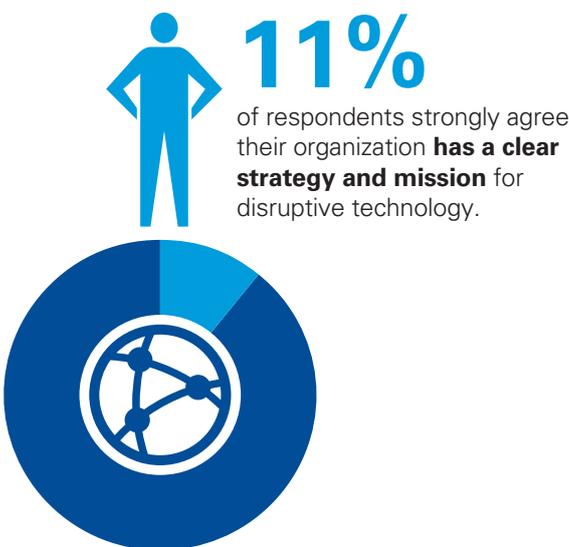
Some telcos have been around for a long time but have never before encountered such unpredictability, with OTT, new

competitors, savvy consumers, criticism over roaming rates and concerns over cyber security. The result is that telecom companies are unprepared. In fact, only 23 percent believe their company is 'very prepared' in terms of a strategic vision for disruptive technology and a mere 11 percent of respondents feel strongly that their organization has a clear strategy and mission for disruptive technology.

Of those respondents reporting a negative impact from disruption, more than half (54 percent) believe that their companies only invest in proven technologies, leaving them 'behind the curve'. However, their main concerns revolve around new and increased competition, with 69 percent stating that disruptive technologies are bringing in new competitors from outside the industry. For example, Google Fiber is is deploying 'last-mile' fiber to homes in Silicon Valley.¹

With speeds of 1,000 megabits per second, the network threatens slower incumbent telcos and turbo-charges potential services from virtual reality to high-definition videoconferencing.

Is the telecom sector underprepared for disruption?



Base: 580 business and IT decision-makers at telecommunications companies
Source: a commissioned study conducted by Forrester Consulting on behalf of KPMG, January 2016

¹ Google Fiber releases San Jose construction plan, Mercury News, 18 May 2016.



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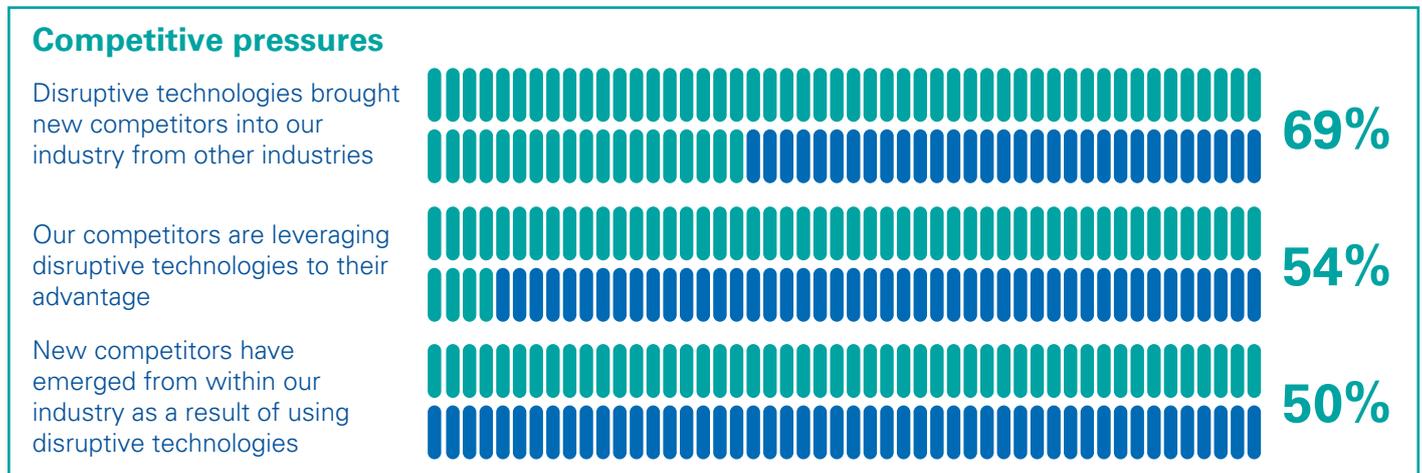
In comparison to the OTT providers, telcos have it tough. They operate in a highly regulated market, they must continue to maintain a sales to capex ratio in the high teens and must maintain a high dividend yield — which their investors expect and, yet, they must also disrupt themselves and their existing business models to stay competitive and relevant. A big part of the answer is organizational agility.”

Peter Mercieca

Global Chair, Media & Telecommunications, KPMG International

Competitive pressures drive disruptive technology fears

“To what do you attribute the negative impact of disruptive technologies on our organization’s performance?”
(Select all that apply)



Base: 72 business and IT decision-makers at telecommunications companies where disruptive technologies are having a somewhat or significant negative impact on their organization

Source: A commissioned study conducted by Forrester Consulting on behalf of KPMG, January 2016





KPMG insight

Pressure to evolve into a new organization

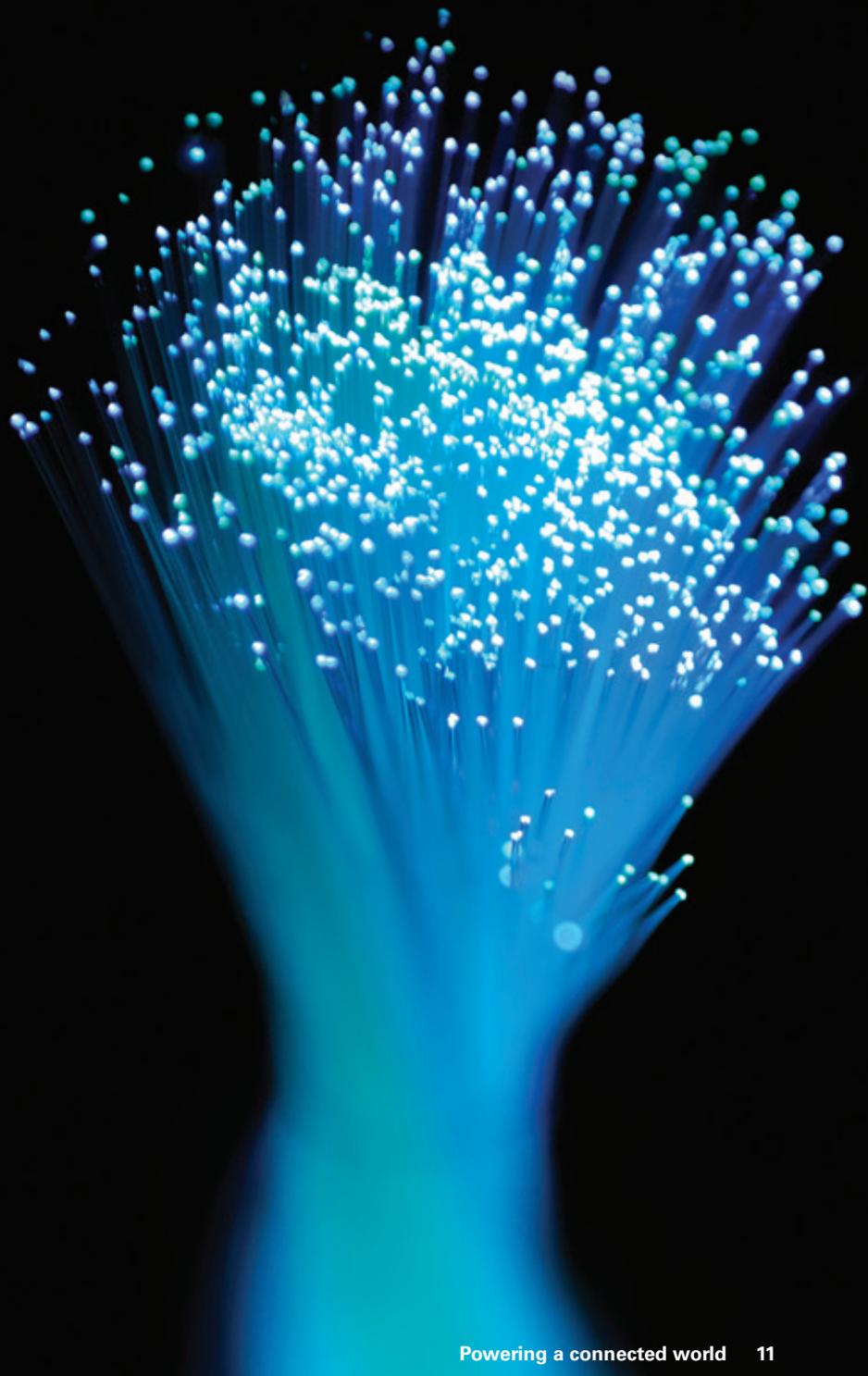
Given the rich potential of the content market, it's little surprise that so many telcos are making moves in this direction. TV and video are popular areas of investment and Telefónica, Verizon, BT, AT&T and others are developing content and digital media franchises. Unlike pure broadband², TV offers a greater chance of capturing a healthy monthly revenue from subscribers.

According to CEO Randall Stephenson, AT&T's 2015 acquisition of DirecTV transformed it into a 'fundamentally different company', by making it the US's biggest provider of TV subscriptions. AT&T has now

joined the ranks of converged players offering bundled TV, wireless phone service and wired broadband. And now, AT&T is moving further into the media space with its proposed agreement to acquire Time Warner.

With their large, data-rich customer bases, telecom firms are in a strong position to understand customers and target personalized offerings. This requires a significant investment in D&A and associated AI and cognitive machine learning — as well as the analytical insights to make the right customer marketing decisions.

² AT&T gets DirecTV and becomes biggest provider of TV bundles, CNN Money, 24 July 2015.





Changing the ground rules: The impact of disruptive technologies

Telcos are investing heavily in disruptive technologies to serve customers better — but are they paying sufficient attention to network quality?

Telcos tend to be big, asset-heavy organizations with extensive infrastructures to build and maintain at one end and large customer bases to service at the other. A majority of telecom executives are excited about the potential of disruptive technology to enhance their business models and operations. But how are these technologies actually impacting their business models and operations?

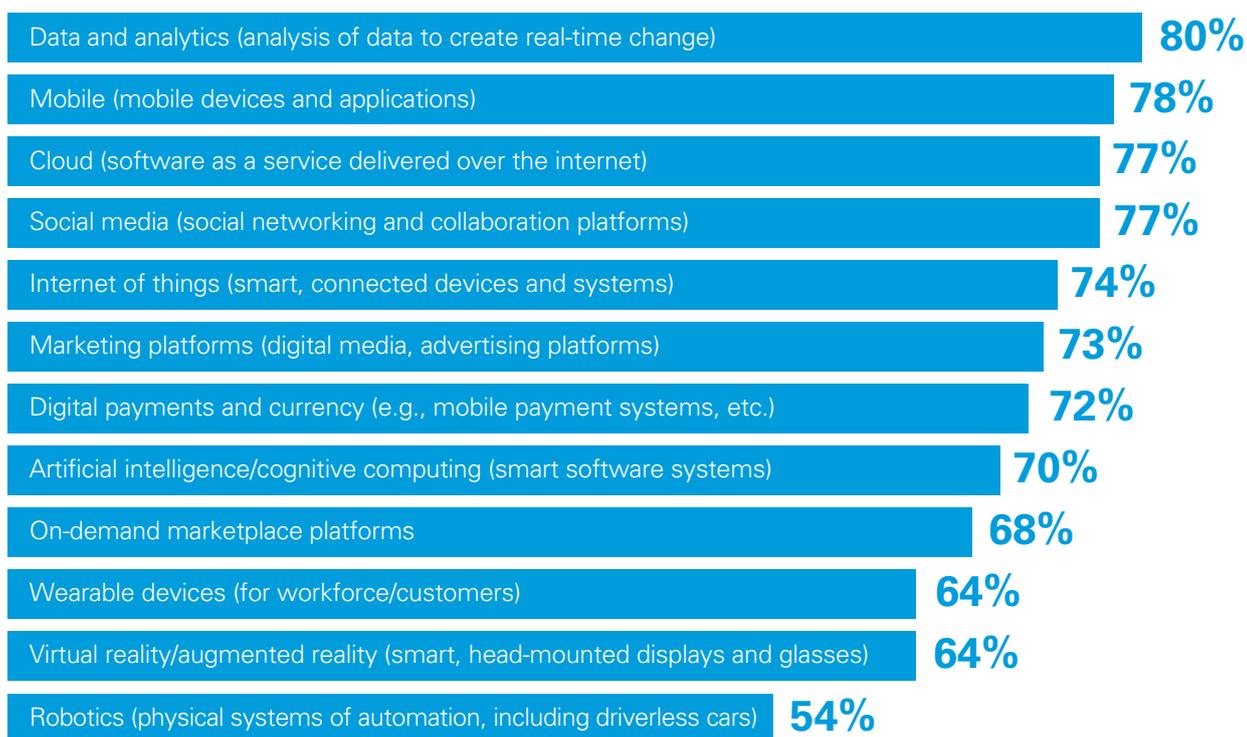
Disruptive technologies as a catalyst for a better customer experience

While the customer dialogue for telcos was once defensive — primarily about reducing costs — the focus has now shifted to increasing the share-of-wallet and raising customer satisfaction. Today, there's an emphasis on customer experience and telecom executives are employing a range of disruptive technologies to help achieve this goal.

Seventy percent or more of respondents say D&A, mobile, cloud, social media, IoT, marketing platforms, digital payments and AI are all changing how they serve their customers.

Impact of disruptive technologies on the way telecom companies serve customers

**“To what extent are each of the following technology areas changing how you serve your customers?”
(moderate or significant impact)**



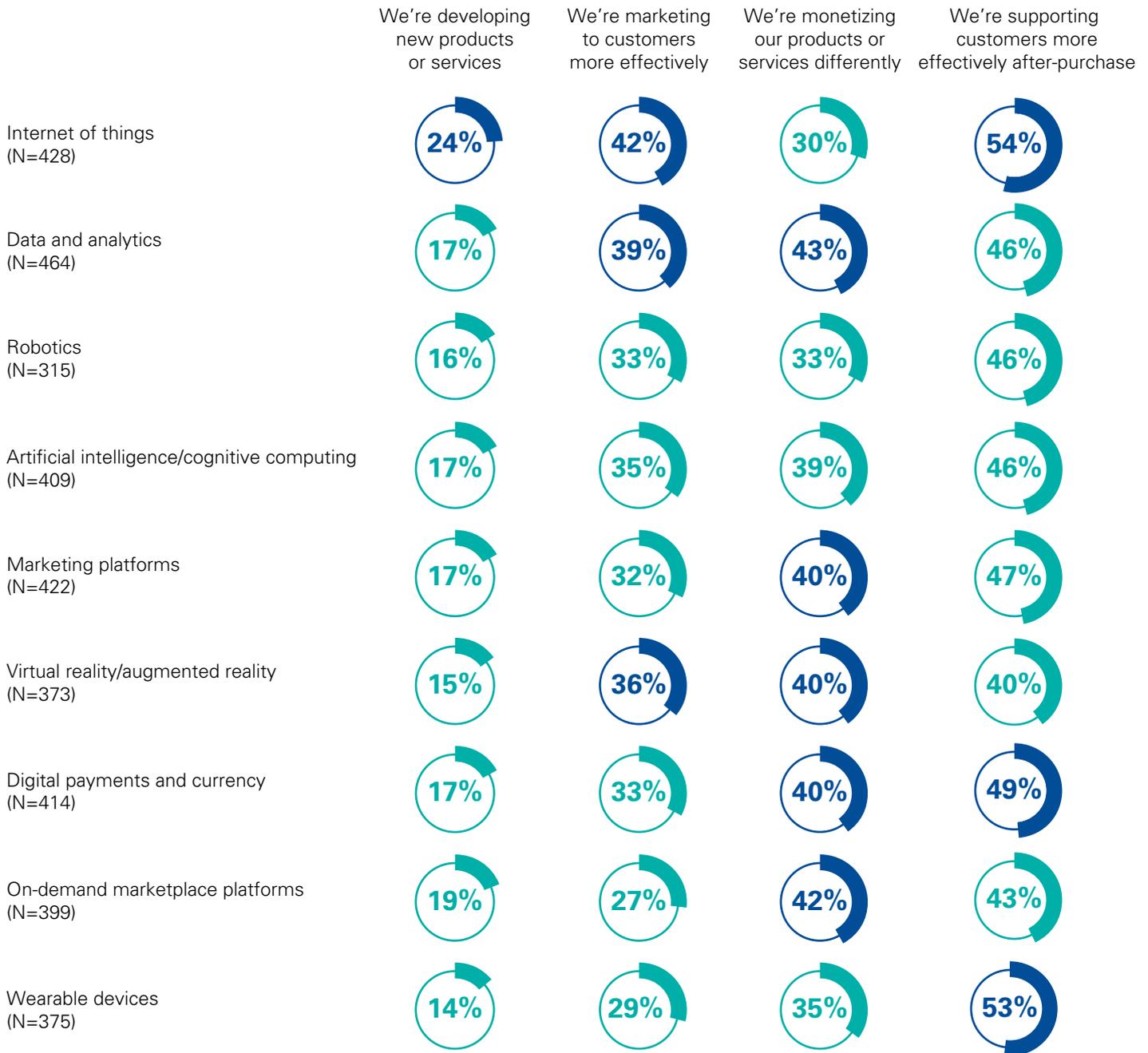
Base: 580 business and IT decision-makers at telecommunications companies
Source: A commissioned study conducted by Forrester Consulting on behalf of KPMG, January 2016

“Disruptive technology has a huge impact on the way I interact with my customers, on the service that I provide my customers and in the way I deliver service to my customers.”

Director of Infrastructure Consolidation and Development, UK telecom company

How disruptive technologies are changing the way telecom companies serve their customers

“How are each of the following technologies changing how you serve your customers?” (Select all that apply)



■ Top-ranked technologies in each category

Base: Varies; business and IT decision-makers at telecommunications companies where disruptive technology is having a moderate or significant impact on how they serve their customers

Source: A commissioned study conducted by Forrester Consulting on behalf of KPMG, January 2016

Marketing to and supporting customers

D&A plays a vital part in understanding customer behavior, giving telcos insights on how to better serve their customers, which, in turn, should increase customer loyalty and reduce churn. As companies move into content such as TV and video, database marketing becomes an even higher priority, to evaluate the tastes and motivations of existing and potential customers.

Interestingly, just 39 percent of respondents feel analytics can help them market to customers more effectively, a surprisingly low figure given the rich data sets that telcos possess.

But it's IoT (54 percent) and wearables (53 percent) that are the top two technologies for supporting customers. These technologies enable telcos to keep in touch with their customers' every move so they can predict and react to their needs, increasingly in real time.

“ Despite having billing relationships and information on millions of customers, many telcos are not using it to the fullest advantage to cross-sell and recommend relevant services as part of an overall heightened experience. In our survey, just 39 percent of telecom executives say their companies use analytics to market to customers more effectively. ”

Alex Holt

Head of Technology, Media & Telecommunications, KPMG in the UK



KPMG insight

Seeking inspiration

This is absolutely not business as usual and there's a huge cultural challenge for companies accustomed to running large networks and customer service operations with significant staff numbers. Many are burdened with these traditional ways of thinking and have yet to undergo the kind of cultural shift necessary to embrace new disruptive technologies.

One good example is data. Telcos have huge amounts of information on customers but often fail to make the most of this to provide essential market intelligence for a range of customers from government, traffic and transport agencies, retailers and logistics companies. They're literally sitting on a goldmine of data and with other revenue streams deteriorating, they need to start to monetize this resource fast.



Building an operational advantage

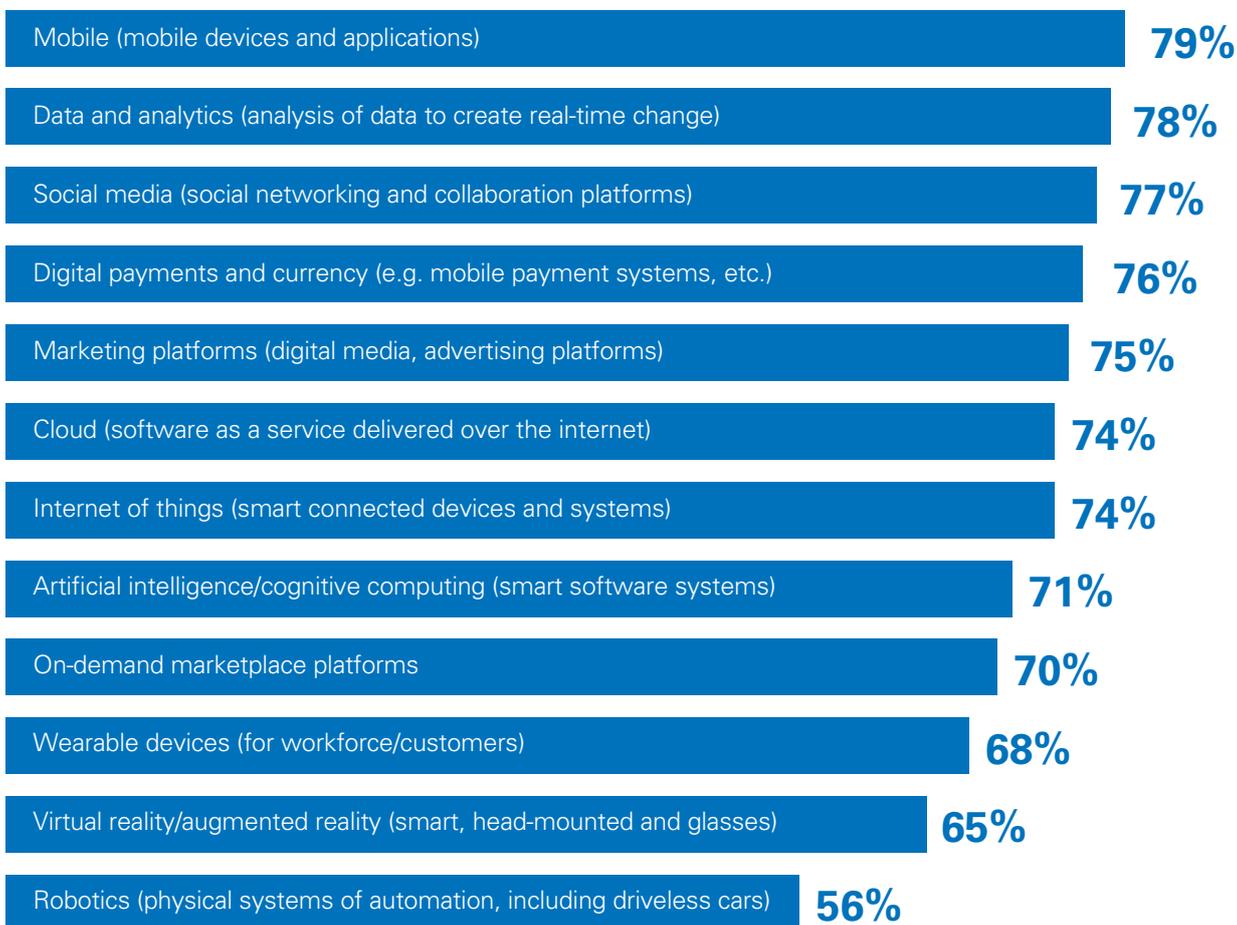
Disruptive technologies bring the kind of operational efficiencies that can improve competitiveness and margins in a sector in which capital expenditure and maintenance costs are traditionally high. Four out of five (82 percent) telecom leaders surveyed

admit that their companies' core operating models are changing as a result of disruptive technologies.

Overall, mobile and D&A are seen as having the greatest impact on how telecom organizations run their operations.

Impact of disruptive technologies on the way telecom companies run their operations

"To what extent are each of the following technology areas changing how you run your operations (i.e. driving productivity, running workflows, moving goods and services, operating infrastructure and other internally focused business activities)?" (Moderate or significant impact)

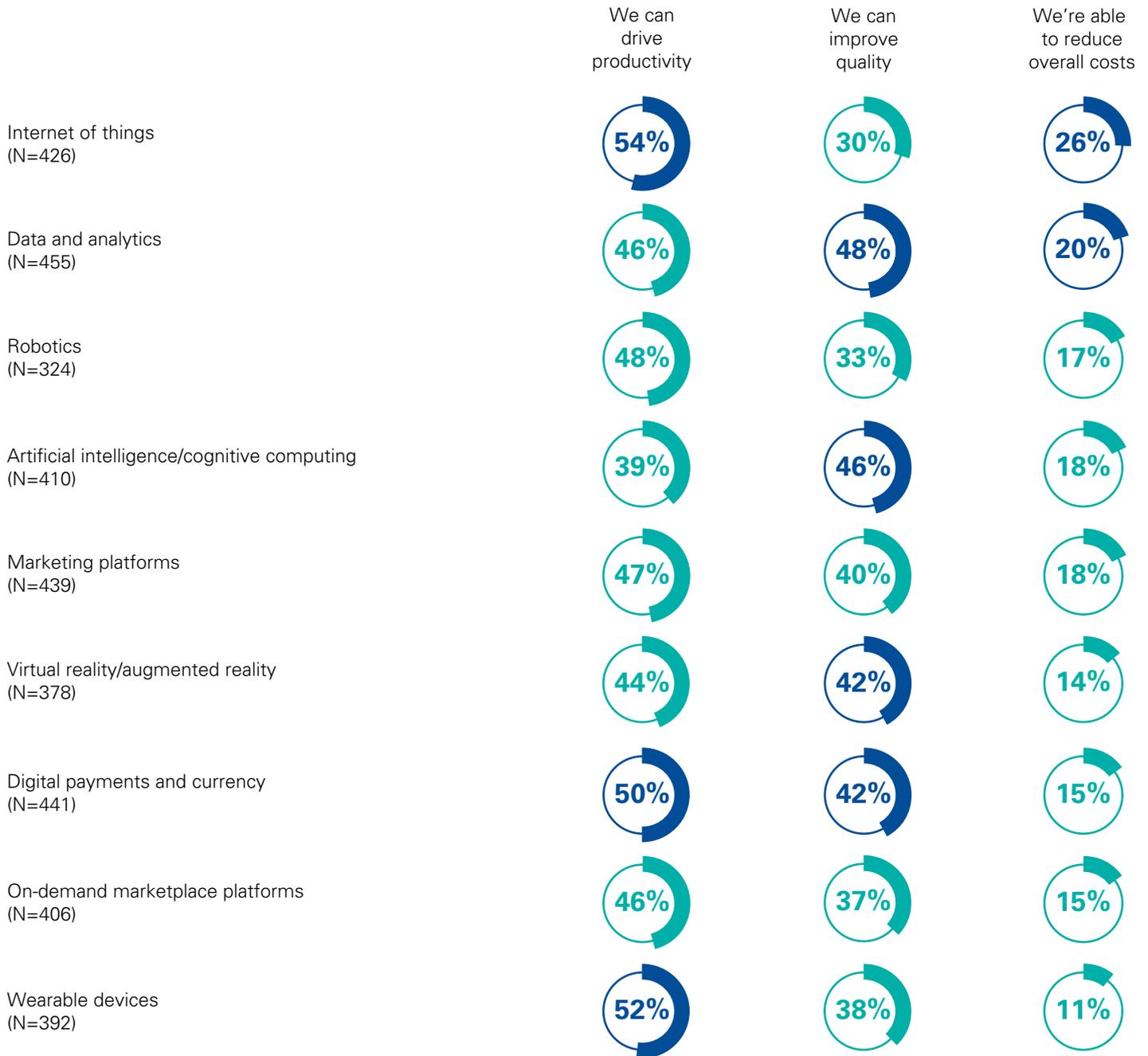


Base: 580 business and IT decision-makers at telecommunications companies

Source: A commissioned study conducted by Forrester Consulting on behalf of KPMG, January 2016

How disruptive technologies are changing the way telecom companies run operations

"How are each of the following technologies changing how you run your operations?"
(Select all that apply)



■ Top-ranked technologies in each category.

Base: Varies; business and IT decision-makers at telecommunications companies where disruptive technology is having a moderate or significant impact on how they run their operations

Source: A commissioned study conducted by Forrester Consulting on behalf of KPMG, January 2016

Driving productivity and network quality

Disruptive technologies are helping telcos realize productivity gains. With IoT (54 percent), wearables (52 percent) and digital payments and currency (50 percent) seen as having the greatest impact.

By utilizing sensors and smart devices, telecom companies can gain a number of important benefits from IoT, through preventive maintenance on their networks and tracking and auditing assets as they move through the supply chain.

First, they can get more out of their assets by gaining essential information on efficiency levels and maintenance needs to

ensure that repairs are carried out promptly and that equipment is serviced when needed. Supply chains can also improve, as IoT makes it easier to track, trace and audit assets as they move along the chain. However, only 30 percent believe that IoT is aiding their efforts to improve quality, suggesting that many are missing a significant opportunity.

Another disruptive technology with the potential to make telcos more productive and drive greater quality is VR/AR, with 44 percent of respondents citing this innovation. For example, smart glasses can power the next generation of field technicians, repairing complex infrastructure in a hands-free fashion.



KPMG insight

The importance of a high-quality network

Network outages used to be merely inconvenient. But now, they have considerably more serious consequences as every part of our lives become dependent upon permanent connectivity, from driverless cars to hospital monitors. Today, networks continue to go down with alarming regularity. Should this continue, it will severely impact users and can be catastrophic for providers' reputations.

We believe that telcos are missing a trick or two when it comes to D&A. Conversations about data all too often revolve around customers in terms of segmentation, cross-selling and personalizing offers. These are admirable goals, but they under-leverage the potential of data to improve

network operations and business processes. The volume of performance data that a network churns out is huge, including logs, incidents and performance in towers and mobile networks.

By applying sophisticated analytics and algorithms on internal operations, telcos have an opportunity to radically improve network performance.

IoT is the other half of this equation, to fuel preventive maintenance. Given the vast distances covered by national and regional networks, devices can build intelligence by monitoring remotely, reporting and resolving faults, increasing reliability and reducing the high costs of manual servicing and repairs.

How IoT can help improve preventive maintenance

- inventory monitoring for devices in cellular base stations and data centers
- health monitoring devices for remote base stations
- security systems and biometric devices for access to cell sites and data centers for personnel
- telecom tower fuel monitoring system
- remote alarm monitoring
- integrated telecom site monitoring solutions (outdoor and indoor)
- intelligent power source automation
- remote environment monitoring solutions
- cold chain environment sensor to monitor temperature in sensitive locations.

Only 39 percent report that AI/cognitive computing is currently aiding productivity. Yet, in combination with automation and robotics, this technology can transform the work of a field force engineer, who can use a host of emerging applications to perform a better, faster and more accurate job.

D&A (48 percent) is considered the most effective tool for raising quality, which is particularly relevant to the growing issue of cyber security for critical communications infrastructure.

As every part of our lives go digital, telecom carriers become critical infrastructure, controlling the gateway to all personal,

commercial, government and other institutional data and operations. D&A is the key to cyber security, helping capture, interrogate and analyze data, to understand who's using systems and create robust defences against hacking.

Advances such as connected cars, IoT-powered medical devices and automated manufacturing are marvellous developments but also heighten the risks from malicious or criminal infiltration. Telecom companies need to create networks that are highly robust, to fulfill the expectations of tomorrow's users.



Setting investment priorities: a focus on the customer

The right investments in disruptive technologies can bring significant competitive advantage and reflect the direction in which the telecom sector is moving. Companies can monitor their peers' strategic priorities and consider whether they are on track or alternatively, whether they are falling behind in certain essential technologies.

Our survey findings suggest a broad range of investments, with the most common being cloud (65 percent), mobile (64 percent), marketing platforms (59 percent) and D&A (58 percent). This indicates that telecom leaders are casting their net wide and hedging their bets when investing in disruptive technologies.

When making investments, customers are prominent in the minds of telecom executives. The single most important investment objective, according to 38 percent of survey respondents, is to improve the quality of products and

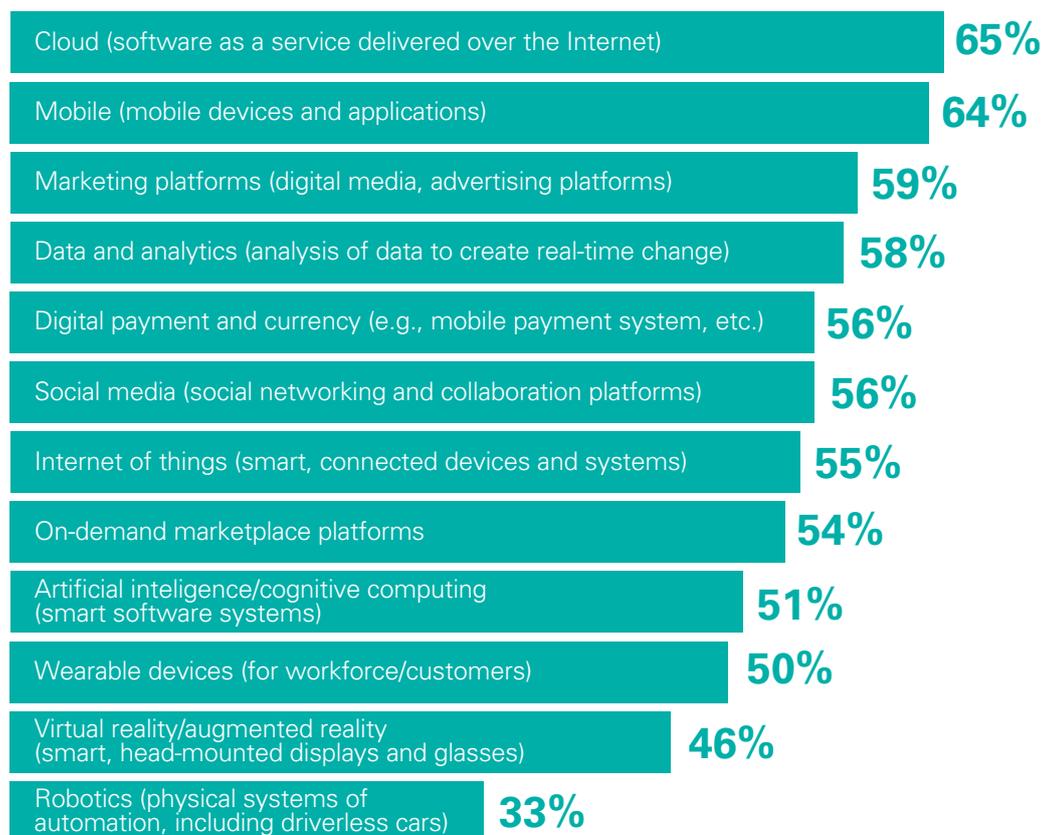
services. Other customer-oriented capabilities, such as marketing, acquisition, customer experience and post-purchase support, also feature strongly.

Investment goals, inevitably, reflect the company strategy. Some are aiming to be major content players, while others want to serve the corporate market to become low-cost carriers. In less-developed regions, some telcos are making a play for the digital financial services (banking and insurance) market, in which many citizens have mobile phones but no bank accounts. Products these companies offer include payments, loans, deposits and credit ratings.

Forty-six percent of respondents are making a tangible or strategic investment in VR/AR. Those focused on the business market should consider the potential of this technology to virtualize the global network and improve communication and connectivity.

Disruptive technology investments

"To what extent is your company investing in each of the following technologies?" (Tangible or strategic, significant investment)

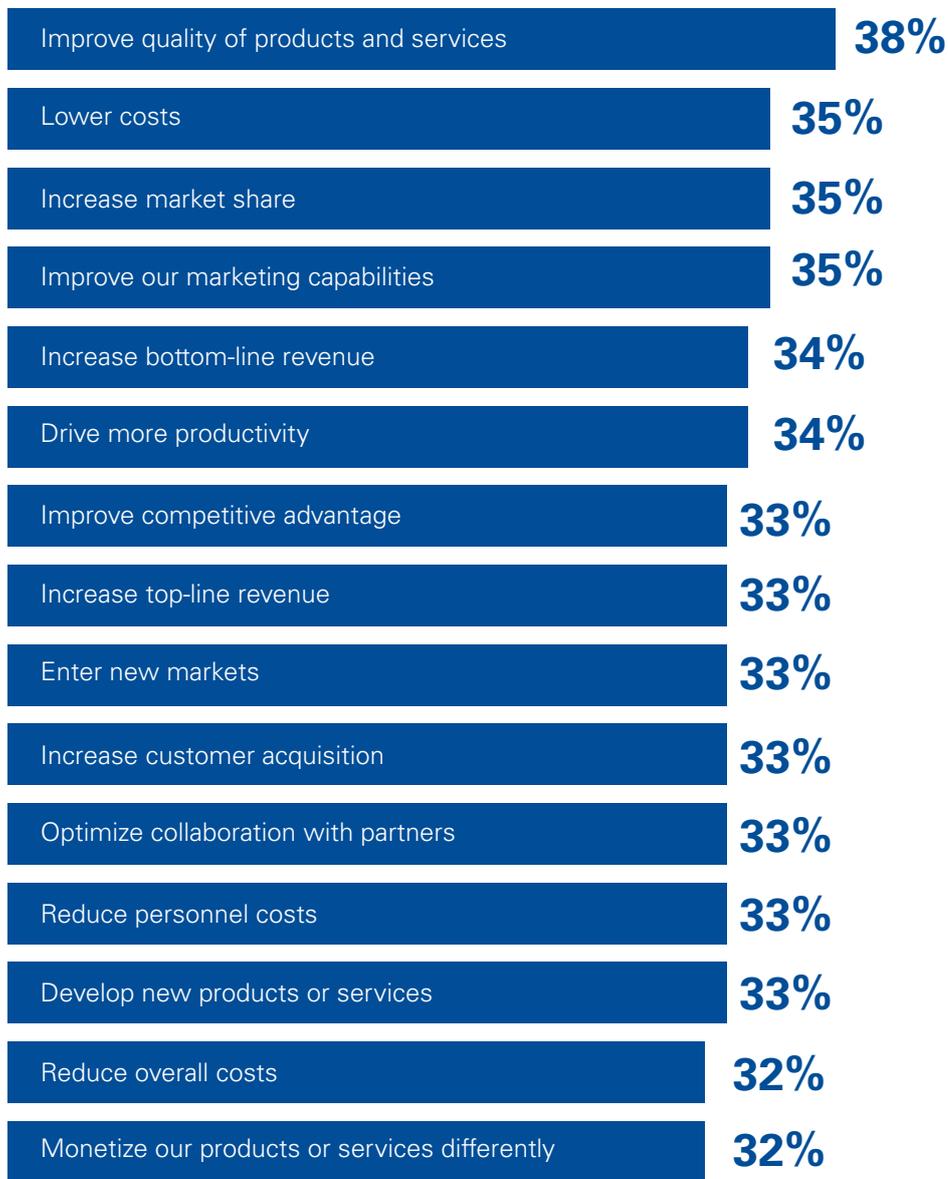


Base: 580 business and IT decision-makers at telecommunications companies

Source: A commissioned study conducted by Forrester Consulting on behalf of KPMG, January 2016

Most important business goals when investing in disruptive technology

When investing in a disruptive technology, what are your company's most-important business goals?"
(Select all that apply)



Base: 580 business and IT decision-makers at telecommunications companies

Source: A commissioned study conducted by Forrester Consulting on behalf of KPMG, January 2016

According to our global survey, the key investment goals fall into two categories:

Product strategy

Ranking among the top business goals, telecom leaders are leveraging disruptive technology to improve the quality of products and services (38 percent), enter new markets (33 percent) and develop new products or services (33 percent). For example, Verizon plans to optimize its bandwidth to serve the growing demand for VR/AR.

It's important is to encourage product managers and strategists to participate in your selection process when

investing in disruptive technology, to ensure there's a planned link to new product development.

Business operations

Telecom leaders continue to invest in disruptive technologies to drive improvements in fundamental operational performance. Productivity (34 percent), lowering costs (35 percent), and increasing bottom line revenue (34 percent) all play a key role. As a telecom executive in the UK tells us, his firm continues to invest in solutions that lower the cost of acquisition of customers, particularly high-value customers. To do so, his company has invested in advanced analytics and data platforms, which he reports "gives us a competitive advantage in terms of cost".

The Disruptive Technology Value Map: The intersection of investment and impact



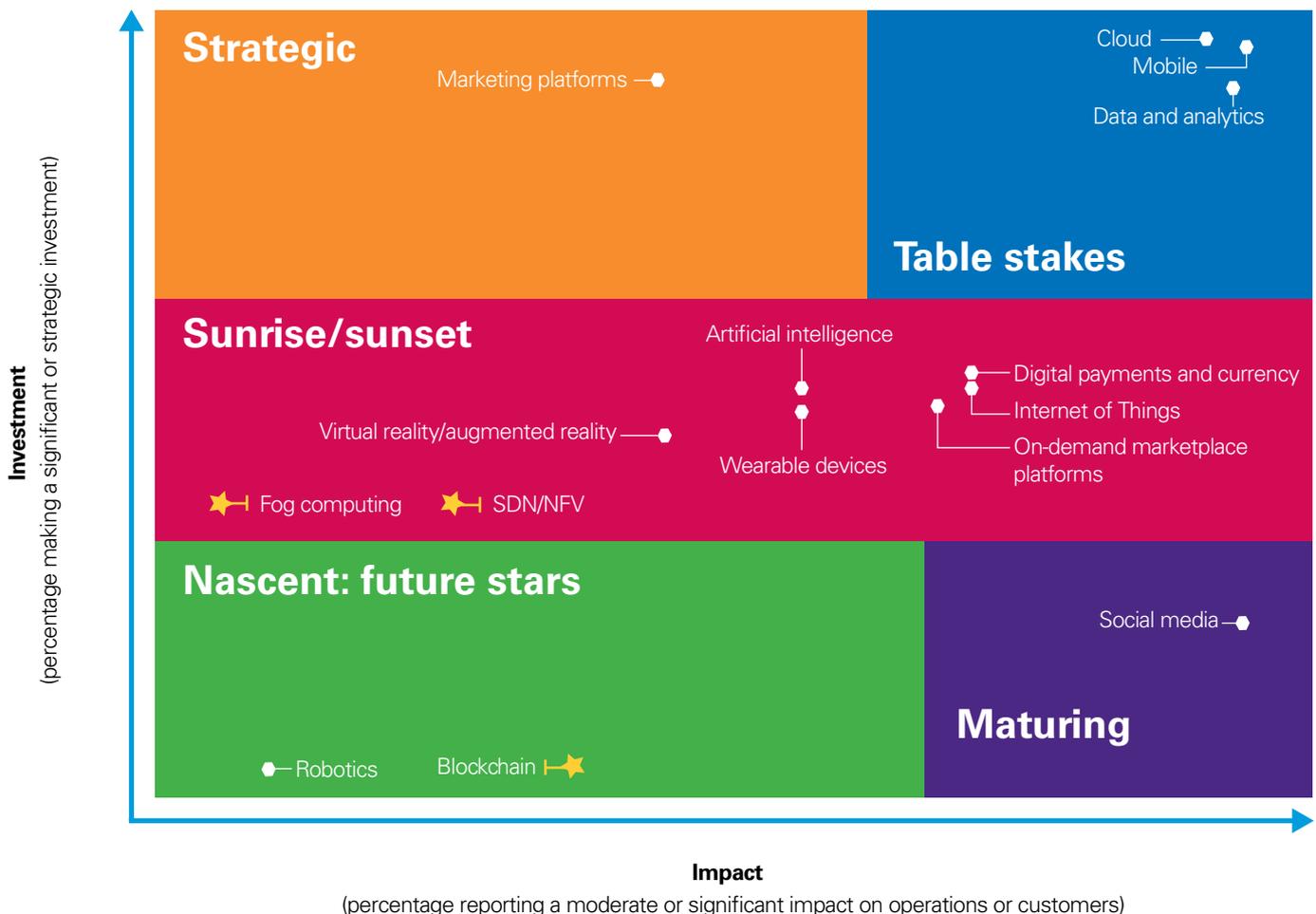
Will 'sunrise' technologies meet their promise?

Telecom companies are making sizeable investments across many different disruptive technologies but are they seeing value from their outlay? And are they choosing the right technologies at the right time to optimize competitive advantage?

Building on data and insights from our research, we evaluated the measured disruptive technologies using the following metrics: impact on operations, impact on business models and level of investment.

Combining these three metrics into a framework — which we call the Disruptive Technology Value Map — helps telecom leaders guide investment decisions on disruptive technologies. It also enables companies to benchmark themselves against their peers to prioritize different disruptive technologies. Disruptive technologies fall into five key categories, based upon the investment-versus-impact model:

KPMG framework: Disruptive Technology Value Map



★ Inclusion of this technology is based on KPMG subject matter insights. This technology was not included in the survey.

Base: 580 business and IT decision makers at telecommunications companies

Source: A commissioned study conducted by Forrester Consulting on behalf of KPMG, January 2016

Five stages of disruptive technology

Based on investment-versus-impact model

01 Table stakes

Table stakes technologies receive high investment and generate strong impact today. They have reached an initial phase of business maturity but remain vigorously innovative and challenging to master. In telecommunications, mobile, cloud and D&A represent table stakes. For many telecommunications firms, 5G mobility and the opportunity for cloud represent the future of the product set and, arguably, a strategic investment. These firms stand at the forefront of developing and selling those technologies. So there is a particular emphasis on doing those well and using data and analytics to further monetize those product sets.

02 Maturing

For telcos, social media has reached maturity. It's an indispensable tool that doesn't require great ongoing investments.

Social media can inform a host of strategic and operational decisions, with vital, real-time feedback on network performance and perspectives on customers and regulatory stakeholders. Tracking and managing expectations is a critical differentiator in a world in which customer expectations keep rising and reputations can be damaged by a single outage.

03 Strategic

Strategic technologies receive significant investment today in search of strong impact tomorrow. They are high on investment and medium-to-low on impact. Marketing platforms have quickly become a vital tool for telcos, enabling increasingly sophisticated customer targeting for the cross-sale of telecommunications services, improving conversion rates and reduce churn. For those telcos moving into content and other new services, this capability, aided by strong data sets and detailed analytics, should help them gain a competitive edge.

04 Sunrise/sunset

Sunrise technologies receive medium levels of targeted investment and have begun to generate medium levels of impact. Sunset technologies have passed their era of effectiveness and see declining levels of investment and impact. In telecom, they're all sunrise technologies: on-demand marketplaces, IoT, AI, wearables, and VR/AR. One sunrise technology that has a positive impact outlook for telecommunications firms is digital payments, which can be customer-facing (e.g. Samsung Pay or Apple Pay), wallet-based (e.g. Google Wallet) or back-end (e.g. a payment processor).

05 Nascent: future stars

Nascent technologies receive lesser levels of targeted investment and have yet to generate serious impact but they are seen as potential future stars. Robotics-powered D&A is already replacing swathes of jobs in the customer service and shared services functions. Robotic process automation — software robots that use rules-based logic to execute specifically designed tasks — can improve speed and accuracy of decommissioning and reduce costs substantially.

"It may fall into the stage of a future star but robotic process analysis, allied with the power of cognitive computing, will drive a lot of cost out of the front- and back-office operations of telecom organizations in the next few years." Peter Mercieca, Global Chair Media & Telecommunications, KPMG International

Fog computing: Rising potential

As demand for bandwidth and data volume — particularly from smart devices — strains telecom networks' capacity to the limits, other new solutions are emerging. Fog computing is firmly in the sunrise stage and has the potential to extend cloud computing through virtualized resources on 'the edge' of mobile networks to power both cloud and mobile applications. With fog, less data is transported to the cloud for data processing, analysis and storage, raising efficiency and security.

Fog is especially relevant to the growing popularity of IoT and the huge volumes of data generated by sensors. Considerable bandwidth is required to transmit all this data to the cloud for processing and analysis. Should this capacity get overwhelmed, there can be delays in data transmission, which can be critical — even life threatening — if they negatively impact systems such as vehicle communications, rail travel or healthcare.

NFV and SDN: The new differentiators

Network Functions Virtualization (NFV) and Software Defined Networks (SDN) are both sunrise technologies and enable a software-based approach to networking. This creates more scalable, agile and innovative networks that can better support clients' data-driven businesses.

NFV is about optimizing the network services themselves, taking functions that were typically hardware-driven and running them in a virtualized environment via software. This reduces capital expenditure on hardware and supports pay-as-you-grow models to eliminate wasteful over-provisioning. It also reduces operating expenses as you need less physical space, energy and cooling requirements for the equipment. Speed-to-market increases, so telcos can trial and deploy new networking services to support changing business requirements and scale up or down to address fluctuating customer demand.

SDN separates the network's control and forwarding and provides a centralized view of the distributed network for more efficient orchestration and automation of network services.

Blockchain: Another future star

We believe Blockchain is a future star and will be another critical disruptive technology as the potential next-generation technology behind digital identity, payments and currencies. Because it breaks down data into infinitely smaller constituent parts, new entrants could offer and charge for individual pieces of content accessed via the internet through web articles, TV channels, films and other content, all on a real-time, pay-as-you-go basis, without involving the service provider or content provider. This could eat into the voice and data revenue of telecom firms, which need to find ways to integrate Blockchain into their operations.



KPMG insight

Reimagining the telecom business model

As data, via the cloud, becomes the new battleground, how can companies carve out a distinctive niche and avoid being mere commodity providers?

In order to adapt their networks to meet this new challenge, telcos are investing in NFV and SDN. This involves a fundamental change to the way networks are designed and built — as well as introducing relationships with newer, less familiar suppliers.

NFV needs significantly less hardware because server capacity can be added through software, reducing both capital and operating expenses and adding much-needed flexibility. These networks can be built faster and less expensively than conventional, hardware-based offerings and bring improved performance and an enhanced customer experience.

Shifting to a platform-based network — and building products to go with it — is likely to take time, especially as today's telcos cannot simply leave their existing 2G and 3G customers behind. In addition, these providers need scale from day one, as any new service has to work across the entire network. Lead times for achieving these upgrades could be as much as 18 months per market — far longer than those achievable by the likes of Amazon and Google.

A recent report by research firm Technology Business Research forecasts the global NFV and SDN market to grow at 116 percent annually through to 2021, to reach approximately US\$160 billion per year. Although the initial driver was to reduce capital expenditure, there is now an increasing focus on service agility and operational efficiency.³

Supporting IoT is likely to become ever more important in light of the proliferation of connected devices. Many, if not most, IoT devices need only very low-speed connections and operators should consider investing in low-power, wide-area networks.

The main players are becoming active in NFV and SDN

Early adopters of NFV and SDN, like AT&T, began to ramp up investment in 2015 as transformation became their top strategic priority.

AT&T, which has made no secret of its desire to use software and virtualization to offer a range of cloud-based services, plans to roll out an SDN-based service across 63 countries.⁴

Australian operator Telstra has also launched a NFV/SDN service to its business and enterprise customers, enabling the company to set up bandwidth on demand and provision virtual network appliances like firewalls. Telstra feels that telcos have a distinct advantage in this technology, as Jim Fagan, head of cloud practice, explains: “The fact that we own the underlying core network enables us to add a lot more features and functions and continue to build on the core platform.”⁵

And Verizon's director of SDN/NFV network architecture planning, Gagan Puranik, recently said, “Consumers today are hungry for new, innovative applications — such as virtual reality — that require large throughput and low latency. We believe next-generation networking that leverages SDN, NFV and mobile edge are foundational for 5G (and beyond).”⁶

³ *NFV/SDN Telecom Market Forecast*, Technology Business Research, 13 June 2016.

⁴ *AT&T SDN, NFV efforts claim financial return, international expansion planned*, RCR Wireless News, 24 May 2016.

⁵ *Telstra launches 'transformative' SDN/NFV service*, Computer World, 8 March 2016.

⁶ *Verizon SDN, NFV plans look to open source to counter challenges*, RCR Wireless News, 24 March 2016.

Strategies for a disruptive future

To remain competitive and drive their businesses forward, it is critical for telcos to develop disruptive technology strategies that are aligned to corporate goals.



“Telecom companies need to become internet companies.” Those are the words of Andrew Penn, CFO (now CEO) of Telstra, Australia’s largest telecom operator, who goes on to say, “Telcos, if they’re going to survive and be successful in the future, will have to find ways to continue to invest in network expertise and excellence, try and solve that challenge, which is going to grow.”⁷ Telecom companies are striving to innovate in the digital world, however, many are also fearful of their ability to transform their business models and become platform-based technology companies. Seventy-eight percent of the survey respondents worry that their businesses lack the organizational flexibility and agility to deal

with disruptive technology. This is a big concern, given that the new market entrants typically have a lower cost-to-serve and more efficient operating models.

Network scale and distribution is still vital for telcos. Any new service has to work across the entire network. In the platform age, however, these capabilities alone are not enough to escape the commodity trap. The new differentiator is agility, to offer faster and more flexible delivery and greater product range. Tomorrow’s customers demand services that are faster and simpler to access, use and manage, with wider choice and the ability to sign up, scale up or down or terminate on demand within seconds.



KPMG insight

Becoming fleet-footed and customer-led

Telecom companies believe that their lack of flexibility and agility is a concern, and they are right to be worried. If telcos want to remain competitive and relevant players in our digitally connected world, they’ll have to be able to move quickly to take advantage of the numerous opportunities that will continue to arise — opportunities that go far beyond connectivity.

As connectivity becomes ubiquitous and individuals and organizations rely on a near-perfect network service 24/7, telcos risk becoming commodity providers. Far

worse, they could be squeezed out of the network space altogether by new disruptors. The photographic sector offers a good example. People today take far more photos than ever before, but it’s not the traditional companies that invented the digital camera that are dominating the sector. Instead, it’s mobile phone manufacturers and internet businesses, like Instagram, that are deriving the most value. To avoid this fate, telecom companies need to address their flexibility and agility.



Telcos face a dual challenge. They need to implement agile, internal structures that enable them to innovate products and services at pace. At the same time, they are seeking the best way to interact with the entrepreneurial ecosystem to convert relevant market threats into growth opportunities. We call this the ‘hybrid’ approach to innovation and entrepreneurship which, when adopted effectively, allows telcos to play a key role in the ecosystem as active and conscious agents for digital disruption. As with any transformational process, success is dependent upon: 1. full endorsement from the top, 2. cultural change across the organization and 3. agility in implementing new ways of working. ”

Diogo Eloi de Sousa

National Head of TMT, Management Consulting, KPMG in Portugal

⁷ ‘Telcos must transform into Internet companies to survive & succeed’, ET Telecom, 21 January 2015.

Defining a strategy for disruptive technologies

Disruptive technologies introduce an overwhelming array of opportunities for telecom leaders. Do they focus on content? Do they aim for the business market over consumers? Which kinds of platforms and products should they specialize in?

Whichever direction they select, they need to define that strategy and own it and ensure that it is closely aligned with their corporate goals. Take the US market as an example. T-Mobile has ambitious expansion plans with a focus on consumers. Vodafone, on the other hand, has sold its stake in Verizon, has set its sights on the business-to-business market.

According to the telecom executives in our survey, D&A and cognitive computing can provide big boosts to their monetization plans, helping to make products smarter. IoT is of equal importance, as companies strive to create platforms

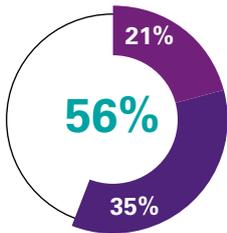
and accompanying connectivity for the billions of devices that will drive every part of our personal and business lives.

D&A, in conjunction with machine intelligence, can also study network topology and historic outage reports to predict the probability, severity and location of future outages in order to help minimize the impact for customers.

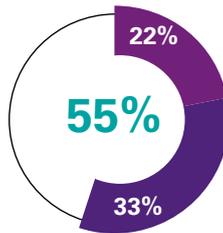
One function that can benefit greatly from the power of analytics is procurement. The major players spend huge amounts each year on capital equipment and other network assets and hold large amounts of inventory. Intelligent forecasting can help predict future needs to minimize stock, while smarter category management should mean more efficient purchasing and economies of scale. A machine can read hundreds of millions of pages of procurement documents in a single second. This kind of power is vital to supply chain efficiency.

How disruptive technologies affect monetization strategies for telecommunications organizations

“How important are each of the following new products and business models to your company’s future monetization strategy?”



Making products smarter with data analytics and cognitive computing



Creating a software platform for the Internet of Things



Offering connectivity services for the Internet of Things



Becoming a payment agent



Disrupting the media space by offering increasingly sophisticated subscriptions to video, content, music, communications and live events

■ Very important ■ Somewhat important

Base: 580 business and IT decision-makers at telecommunications companies

Source: A commissioned study conducted by Forrester Consulting on behalf of KPMG, January 2016

Keeping your organization one step ahead of disruption

If telcos want to be agile in their investments, then their leaders have to keep abreast of the latest innovations, be prepared to move quickly to seize new opportunities and discard technologies that are no longer delivering value. Timing of investments, in addition to strategy, will be crucial. Of those respondents whose companies have seen a positive effect from disruption, 50 percent say they saw the new technology trend earlier than others and 41 percent invested at an early stage. However, it seems that too many still see disruption as something left to the IT department. Just 12 percent agree strongly that their C-level executives keep a close eye on disruptive technologies and 62 percent state that their IT organization is responsible for doing research on disruptive technologies.

Investing in people is equally critical. Jobs such as field maintenance have changed dramatically and call for completely different skill sets. Where once a field engineer had to carry out basic electrical tasks such as fitting copper wire, they now have to be technical experts, able to look at issues as diverse as distributed computing, software, cyber security and ITIL (information technology infrastructure library).

The readiness for such resource needs are varied. Only 43 percent claim their organization has the staffing and skills in place to contend with the effects of disruptive technologies. However, 46 percent say their company plans to hire new talent specifically to help implement these technologies. To compete effectively and be agile and flexible, the telco of the future is likely to be staffed with digital architects, data scientists and developers. However, many of today's telcos have considerable work to do to reach this position.

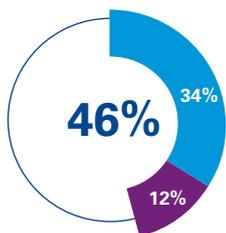
“All areas of our business must adapt to the digital world. Currently, 99.9 percent of our network is used to transfer data, when it used to be all about voice. Even those that communicate by voice do so using data applications. This is an end-to-end change that affects the networks department, the systems department and the human resources department and we have to learn new skills and look at business differently.”

Eduardo Navarro

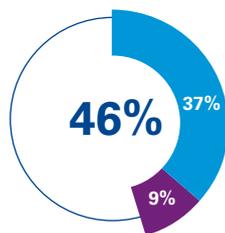
Chairman and CEO of Telefónica Brazil (Former Chief Commercial Digital Officer of Telefónica S.A.)

Transforming your organization for disruptive technologies

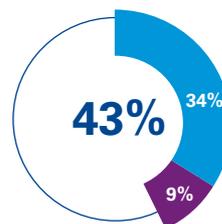
“To what extent do you agree or disagree with each of the following statements?” (Agree or strongly agree)



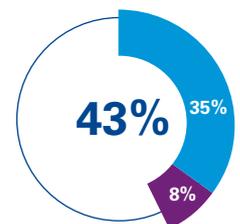
Our C-level executives keep a close eye on disruptive technologies



Our organization plans to hire new talent specifically chosen to help us implement disruptive technologies



Investing in disruptive technologies helps us attract, retain and motivate our workforce



We have the staffing and skills in place to contend with the effects of disruptive technologies on our business

■ Agree ■ Strongly agree

Base: 580 business and IT decision-makers at telecommunications companies

Source: A commissioned study conducted by Forrester Consulting on behalf of KPMG, January 2016.

Conclusion: Creating a roadmap for disruption

The current telecom organizational model is unlikely to survive, as disruption pressures telcos to become platform companies offering a range of services from content to software and everything in between. The shifting shape of the sector is influencing every major executive decision. However, these same executives admit their organizations are not well positioned to adapt to disruptive technologies.



As they continue to be disrupted, telecom companies face a two-tier challenge: they need to become internet and/or content-related organizations, while remaining custodians of networks that are safe, reliable and powerful.

To achieve these dual goals, leaders need to:

1. Clarify investment strategies and prioritize disruptive technologies

Disruptive technology should be at the top of every telco executive's 'to do' list. They should understand how technologies such as D&A, IoT, cognitive computing and robotics can enhance operations and customer models. If a telco doesn't have an automated customer interface, it is likely to lose out to others that do. If it hasn't harnessed IoT and predictive analytics to reduce its level of network outages, it will quickly lose customers in a world in which switching is instant. Telecom leaders have to be fully up to speed with the potential of disruption to ensure that they can be responsible for the big decisions. This means aligning investments with their chosen corporate direction and making fast, informed choices on which technologies to adopt or discard to ensure that they are optimizing the value they gain.

2. Master D&A and leverage it to its full potential

Data drives everything, from network operations to procurement, from finance and revenue recognition to marketing and customer service, from content provision to training and development. Automation and machine learning are essential components of the customer experience. Sophisticated D&A can transform network operations by predicting demand and maintenance needs and detecting faults. Cyber security is becoming more and more important and D&A can be used to shore up systems and spot attempted breaches. Only by fully understanding the options available and the stellar advances in machine learning can telecom executives make the right choices in analytics to drive the business.

3. Harness disruptive technology to boost network quality and reliability

Telecom networks are integral to our world today and they need to be flawless, with immaculate and highly automated processes. IoT, enhanced by advanced analytics and virtual reality, can vastly improve the reliability of networks and help prevent outages through remote monitoring and analytics. From inventory tracking to heat sensors in sensitive locations and remote site monitoring to intelligent power automation, IoT brings a host of ways to improve the efficiency of operations by improving preventive maintenance.

4. Invest in cultural and organizational change

The future is highly uncertain. Even the most successful telecom companies may see their positions undermined by new, disruptive technologies. They therefore need to become less resistant to change and more open to new business models in order to develop the agility to quickly take on new opportunities or deal with existential threats. This means creating a disruptive-friendly culture, with staff skilled in all aspects of technology. Attracting digital architects, data scientists and developers is a top priority. Without them, telcos will not be able to reap the benefits of disruptive technology. As software becomes ubiquitous to every job, every employee needs to become a 'techie'. Telcos should ensure that their people understand the potential of disruptive technology and are equipped with the technical skills to apply solutions.

However, it's not just about technology. Telecom companies have to take a more customer-centric view of the world and strive to offer a superb customer experience. Disruption occurs when customers are underserved. Whether it's poor network availability, unclear or incorrect billing or inadequate customer service, telcos are at the mercy of new competitors and have to up their game to survive. None of the above can happen without leaders fully committing to disruptive technologies and being prepared to make dramatic changes to their business and operating models.

About the survey

In January, 2016 KPMG commissioned Forrester Consulting to conduct a global study on disruptive technology adoption trends within the telecommunications sector and the organizational and customer impact of these technologies on the main players. We surveyed 580 senior executives within telecommunications companies from 16 countries. The respondents represent wireline or wireless carriers, satellite providers, VoIP services providers and other similar organizations. The study offers insights into the fears, opportunities, organizational changes, investments and key performance indicators deriving from disruptive technology.

Quantitative questions cover:

- the key disruptive technology adoption trends within the telecommunications sector
- how these technologies are impacting companies' business models, operations, marketing and customer-facing activities

- in which disruptive technologies are the respondents companies investing
- what they hope to achieve from these investments.

Respondents represented major telecommunications companies in 16 countries: Australia, Brazil, Canada, China, France, Germany, India, Israel, Japan, Portugal, South Korea, South Africa, Spain, Taiwan, the UK and the US.

The findings have been augmented with the views of telecommunications leaders, subject matter experts and KPMG's telecommunications experts from across its global network of member firms.

This survey is part of a wider body of research into the technology, media and telecommunications industries, involving 1,740 senior executives (580 from each industry).

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Helping you chart a path through the world of disruptive technology: KPMG's telecommunications team

KPMG's team of telecom experts works with some of the largest fixed, mobile and satellite companies all over the world — as well as software, entertainment and media companies — to help you address the urgent challenges brought on by disruption and better align your capabilities with today's consumer.

Whether this means acting as a central ecosystems manager or providing network, software and device capabilities, our global team can help you define strategies to adjust to today's rapidly changing market.

We use our deep experience to address challenges such as:

- improving customer care, acquisitions, retention and leveraging data and analytics
- growing revenue, minimizing expenses and boosting internal operational efficiencies, while reducing IT security risks
- leveraging smart tax strategies, tax credits and R&D incentives
- minimizing financial risk, accounting risk and operational risk to drive business performance
- building appropriate tax, accounting and compliance systems for international, cross-border operations
- conducting sophisticated transactions, including acquisitions, exits, mergers and restructurings
- improving governance, transparency, reporting and transaction processes.

Our aim is to help your organization become agile and, in an era of unprecedented disruption, to move quickly to embrace the appropriate innovations and discard those that aren't supporting your strategic growth.

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