Victorious or vanquished?

Digital Reinvention in telecommunications

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Planning to survive the siege

Through their ubiquitous networks, communications service providers (CSPs) have fueled the expansion and evolution of the digital economy. However, in many respects, CSPs are victims of their own success. By enabling environments in which digital innovation can thrive, CSPs today risk being marginalized or even displaced by organizations and business models from the disruption they helped create. To remain at the vanguard of digital advancements, CSPs will need to fundamentally rethink their role and the ways in which they engage with customers and partners. They will need to be essential to customer experience and operating model innovations as they occur. We call this process Digital Reinvention™.

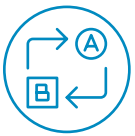
Industry at a crossroads

The telecommunications (telecom) industry holds a unique position in the digital economy by occupying dual roles. Like businesses in other industries, CSPs are facing powerful social, financial and economic forces as well as technological advancements. The confluence of these events has necessitated a fundamental rethinking of how traditional business is conducted, with whom, and within what contexts or models.

But unlike businesses in other industries, CSPs also provide the infrastructure or platform in which the digital economy thrives. As providers of bandwidth for data and telephony through fixed lines, wireless or satellite, the telecom industry has created the environment in which other digital businesses operate. In a very real sense, the industry delivered the technical plumbing that accelerated innovation and the resulting business disruption that reshaped global markets.

As instigator of a dramatic digital expansion, the telecom industry remained unaffected by its most significant impacts, at least for a time. That is no longer the case. CSPs are beginning to risk losing their traditional relationships with customers. Customers on both the consumer and business sides expect their provider to deliver the same quality experiences they receive from digital organizations like Amazon, Facebook and Apple.

At the same time, these and other digital companies are working intensely to anticipate and fulfill customer needs and desires, either directly or through emergent business ecosystems. By doing so, these organizations seek to position themselves directly between the CSP and their traditional clients.



56% of global telecommunications executives say that traditional value chains are being replaced with new value models[1]

52% of global telecommunications executives tell us that the boundaries between industries are blurring[2]

52% of global telecommunications executives report that competition is coming from new and unexpected places[3]

The inevitable consequences of deeper emotional engagement between the customer and digital entrepreneur are greater agnosticism and disengagement between customer and telecom provider. Where customers once held a close association with their phone service or bandwidth provider, CSPs increasingly risk being relegated to the role of commoditized utility, as anonymous to end-customers as an electricity provider in a shopping mall.

Moreover, digital behemoths such as Google have for some time directly embraced the role of connectivity provider – or at least bandwidth service provider – in select markets such as San Francisco, New York and Salt Lake City, among other areas.[4] Facebook continues to have ambitious plans to offer satellite-enabled bandwidth across Africa.[5]

A significant proportion of the global industry leaders we surveyed recognize the significance of these changes. In a recent IBM Institute for Business Value survey conducted in collaboration with the Economist Intelligence Unit, 56 percent of global telecom executives told us that traditional value chains in the industry are being replaced with new value models. A majority – 52 percent – agreed that the boundaries between the telecom industry are blurring. And another 52 percent said that the competition they face is coming from new and unexpected areas.[6]

Digital dissonance

In reality, the disruptions on telecom business and pricing models have been impacting the industry for some time. Even as recently as a decade ago, many CSPs obtained a majority of revenue from text messaging and traditional phone calls, billed by a connection charge or a per-time unit charge, or both.[7] Even bundled service packages typically comprised fixed pricing for a certain number of calls or call minutes, along with internet connectivity and in some instances, cable television.

In recent years, pricing models based on call times have been ceding to those based on data – as bandwidth has become more economical to deliver. These pricing models increasingly rest on unlimited data plans.[8] Strong competition between CSPs, however, has resulted in very low price points and gross margins that may not sustain profitability.

Entrepreneurial businesses such as Skype, WhatsApp and WeChat have been instrumental in driving these changes. These apps have effectively driven the cost of messaging and phone calls to zero. In this way, they have largely destroyed the healthy revenue streams of CSPs, while building an emotional connection with user communities.

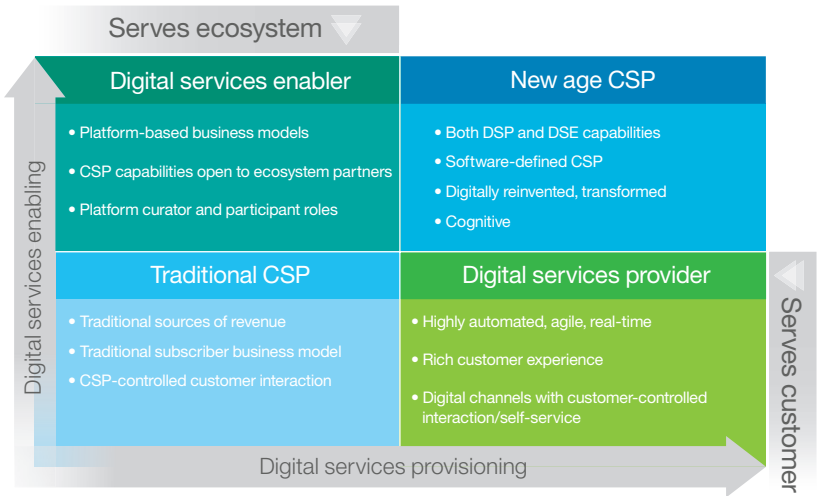
Digital giants – including Apple with its iMessage and Facetime apps – have led the race in disturbing the telecom landscape. All have their own instant messaging, telephony and video capabilities, either through development (for example, Tencent with WeChat) or by acquisition (Facebook with WhatsApp and Microsoft with Skype).

But other digital invaders – from small to large – also threaten CSP legacy revenue streams. Line, a messaging app from Japan, launched in 2011 and reached 200 million users within two years. Line competes directly with the CSPs in the countries where they operate.[9] Just two of many smaller digital players are Open Garden and Twilio. Open Garden's messaging software FireChat allows messages to bounce from one smart device to another without a mobile connection.[10] Twilio enables developers to build internet-based text, voice and video communications capabilities for enterprises.[11]

To avoid the negative impacts of disintermediation, CSPs will need to provide a unique set of services that are either difficult for others to replicate, or that can be provided with greater levels of capability, such as security, privacy or seamless integration across technologies at significantly lower cost. The most successful CSPs are actively redefining their businesses along dual paths of digital services provider (DSP) and digital services enabler (DSE) to counter new types of competitors and remain relevant (see Figure 1).

Figure 1

Two-dimensional strategy for the CSP of the future



Source: IBM Institute for Business Value analysis.

As DSEs, CSPs can build the infrastructure for emergent business ecosystems. A DSE:

- Creates digital commons or environments in which other organizations can interact.
- Provides market-making capabilities.
- Establishes platforms of engagement through which the Internet of Things (IoT) can operate.
- Facilitates environments for hosting, and app and other software development.
- Provides standards and governance to support integration of disparate tools and technologies, as well as interoperability.

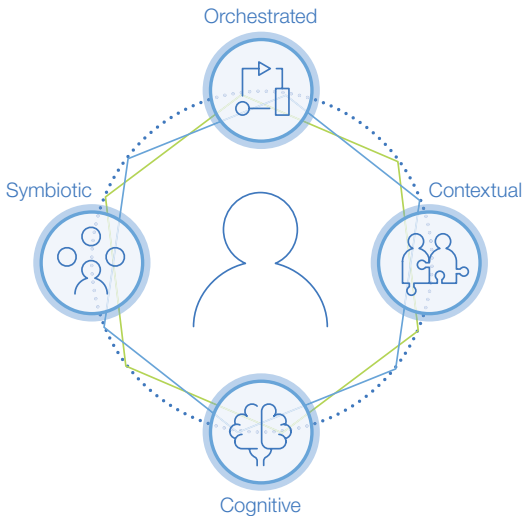
As DSPs, CSPs can extend their current customer relationships to mitigate the possibility of disintermediation and commoditization. A DSP:

- Redefines the role with customers as partner rather than vendor, offering specific services, experiences or collaborations to realize ambitions of consumers or commercial entities.
- Embraces agile automated processes, a digitally savvy workforce and cognitive analytics to provide personalized engagement for a contextual customer experience.
- Puts customer experience at the center of everything they do, turning customers into advocates.

All that you see and E2E

Figure 2

Elements of the everyone-to-everyone economy



Source: IBM Institute for Business Value analysis.

The environment in which telecom businesses and their customers find themselves can best be understood within the context of what we call the everyone-to-everyone (E2E) economy. The E2E economy has four distinct elements: It is *orchestrated*, based on business ecosystems that are both collaborative and seamless. It is *contextual*, in that customer and partner experiences are calibrated and relevant to their specific actions and needs. It is *symbiotic*, in that everyone and everything, including customers and businesses, are mutually interdependent. And it is *cognitive*, characterized by data-enabled, self-supported learning and predictive capabilities (see Figure 2).

The E2E business environment is profoundly digital. And from the earliest days of computerization, and the shift from analog telephony to digital switching and transport in the 1960s and 1970s, the telecom industry has been at the vanguard of digital innovation. This incremental progression reflects the first phase: the phases of digitization through digital transformation, and finally to Digital Reinvention.

Digital transformation in telecom is more holistic and complete. By integrating sets of digital functions and processes, digitally transformed CSPs can offer customers both individualized and omnichannel experiences. Efforts to obtain a single view of customers, break down product or departmental silos, and achieve cross-channel consistency can be understood within the concept of digital transformation. In terms of telephony, bundling voice-over-IP (VoIP) or internet protocol (IP) with standard internet access and cable television also reflects a digital transformation philosophy.

Digital Reinvention of telecom goes further. Digitally reinvented telecom businesses involve a fundamental reimagining of the way these businesses operate and engage with customers and other stakeholders. Shifting away from product- or service-centricity to experience-centricity is key. Digital Reinvention at its most fundamental level reconceives telecom using a customer-first and customer-centric perspective (see Figure 3). The evolution of the CSP along DSE and DSP axes, for example, clearly encapsulates the Digitally Reinvented organization. Creating individualized experiences around particular customers – with the aid of specific products and services from the CSP or ecosystem partners – holds the potential for Digitally Reinvented engagement.

Figure 3

From digitization to digital transformation to Digital Reinvention

Source: IBM Institute for Business Value analysis.

The digital advantage

Digitally conceived organizations often have an advantage in the Digital Reinvention race. Most already possess the needed attributes. They have designed different business models and new ways to fundamentally change the customer experience. In fact, these digitally reconceived organizations reset the customer expectations for the telecom industry, but many CSPs have yet to transform their business models to respond to these new expectations.

A recent survey from MATRIXX software revealed that CSP customers prefer the experience of digital-first companies, with almost three-quarters saying they wish their provider operated more like Paypal, Netflix and eBay.[12] Customers enjoy the digital experience provided by these types of companies, highlighting features like ease of use, clear pricing structure, and real-time access to services and personalization.

Facebook, for example, has changed the customer experience by enabling people to connect and socialize with each other. In this way they habituate consumers to using it. In addition to offering alternative communication channels, they have also built their business models on advertising. Together with Google, they dominate mobile advertising, once seen as the holy grail for CSPs, with over half of worldwide mobile ad revenues.[13]

Tencent gained revenue from many products and services, but the real success came when it transformed from a product to a platform company. It uses WeChat not only as a messaging tool, but to support the company's eCommerce platform and user-friendly payment capabilities.[14] Tencent's market cap is now higher than China Mobile, the largest Chinese CSP.[15]

Many smaller digitally conceived initiatives still have to prove to what extent they are a real threat to CSPs. For instance, Sigfox is a French startup that operates in 36 countries and has reinvented connectivity for the IoT.[16] Another example is Google's Project Fi, which enables users to connect intelligently with the cheapest and best available network.[17] In many cases, startups are acquired by the digital giants as soon as they become successful.

Readying for reinvention

For successful Digital Reinvention, CSPs need to pursue a new strategic focus, build new expertise, establish new ways of working and embrace digital drivers (see Figure 4)

Pursue a new focus

CSPs and their ecosystem partners need to continue developing new, more secure ways of creating compelling experiences, building and hardening platforms, and monetizing new value opportunities. Initiatives might include spawning new business models that use born-on-the-cloud IoT, cognitive and other open application assembly platforms; tapping new forms of financing; and developing better, more holistic ways of conducting risk assessments. Leaders will also need to create deep, cognitive and augmented artificial intelligence (AI)-enabled contextual capabilities to deliver customer-driven experiences.

Build new expertise

Successful CSPs also need to continue to drive digitizing processes, functions and activities enterprise-wide, to the full extent. Analog or manual processes are not conducive to either efficiency or agility. New forms of intelligent automation, including cognitive and robotic process automation (RPA), can be integrated into operations.

Reconceived processes will need to be flexible – and to the extent allowed by regulation – support individualized experiences, and ecosystem connectivity and transparency. To achieve this, CSPs must foster an organizational culture that is grounded in innovation, openness and collaboration. They should enable digital-first operations, such as digital studios, to create apps and customer-driven experiences, as well as ongoing workforce learning, and enablement of modern concepts and technologies.

Figure 4

Digital Reinvention is founded on new experiences

Source: IBM Institute for Business Value analysis.

AT&T transforms into a media and technology company

With its acquisition of DIRECTV and pending acquisition of Time Warner, Dallas-headquartered telecom giant AT&T is taking steps to compete with potential technology and content companies like Netflix and Comcast. Through these acquisitions, AT&T has the potential to combine content from Time Warner with the distribution networks of mobile services, broadband and TV of AT&T and DIRECTV. It is also pursuing network virtualization to manage growing network demands and to improve internal efficiency, time-to-market and service quality. AT&T has a goal to virtualize 75 percent of its network by 2020. To meet this transformation head-on, the company embarked on a massive reorganization. It is investing heavily in retraining current employees to help them better adapt to inevitable industry disruption.[18]

Establish new ways of working

CSPs need to identify, assemble and retain the talent necessary to create and sustain a highly digital organization. It will be essential to perpetuate innovation within the CSP organization and across the ecosystem. Incorporating design thinking, agile working and fearless experimentation can drive extreme automation of digitized operations using a combination of tools and technologies, such as business process management (BPM), RPA, mobile, cognitive decision making and chatbots. Using this approach, CSPs can cut costs significantly, especially in B2B operations, and channel the savings to fund additional investments in innovation and growth. By one estimate, a comprehensive digital transformation could dramatically double a mobile operator's cash-flow margin.[19]

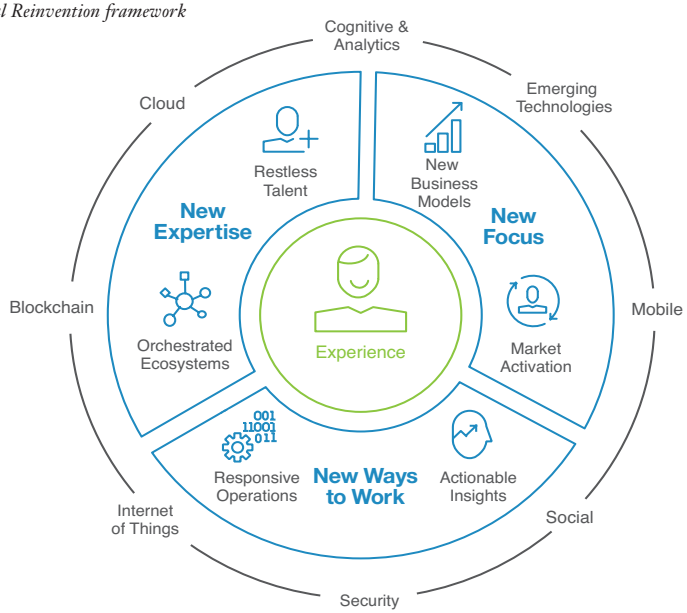
Embrace digital drivers

CSPs will also need to remain digital leaders. Technology underpins platforms and ecosystems fundamental to DSE business models, and is foundational to create the reinvented customer experiences required for DSPs. Leading technologies such as cloud, cognitive, blockchain and others can be essential for CSPs in their Digital Reinvention.

Using cloud technologies, CSPs can benefit from access to modern tooling such as DevOps – comprehensive platforms enabling rapid application delivery and flexible boost/throttle compute capacity. Blockchain technology enables DSEs to create trust-based collaboration and partnerships. Furthermore, a combination of cognitive and analytics capabilities can help CSPs deliver contextual and personalized digital customer experiences while becoming

proactive to their customers' needs. In contrast to an incremental approach, Digital Reinvention provides a pathway for the most visionary CSPs to adopt an "experience-first" planning approach, employing the strengths of ecosystem partners and themselves (see Figure 5).

Figure 5
Digital Reinvention framework



Source: IBM Institute for Business Value analysis.

Orange embraces experience-led customer-centricity

Paris-headquartered Orange S.A. (formerly France Telecom S.A.) is creating new, open digital ecosystems to provide a platform to accelerate innovation among participating organizations and individuals, and better serve its own customers. The company is encouraging participating businesses and developers to move past traditional value chains, and disrupt traditional business and operating models, despite the risk to traditional revenue sources. In its role as DSP, Orange is also seeking different ways to engage with its customers. For example, it recently acquired a 65 percent stake in French insurer Groupama's banking unit, with an objective of setting up a 100 percent mobile-only "Orange bank." The company's wide-ranging entrepreneurial activities are predicted to attract more than 2 million new customers and generate around EUR 400 million in revenue to the telco by 2018.[20]

Reliance Group's Unlimit launches IoT services in India

Mumbai-headquartered Reliance Group has become the first CSP in India to set up a dedicated and integrated IoT company under the name Unlimit. Through Unlimit, it will use partnerships and an international management team to tap into the growing IoT market. Unlimit's mission is to provide IoT services to the medical, industrial and logistics sectors across the country. Watson IoT Platform will help collect and connect data, including sensor data, from devices and provide use-case specific dashboards. Unlimit plans to provide customers with access to the platform capabilities to help them leverage IoT-driven insights and information for business decisions, and create new product offerings and revenue streams.[21]

Deep dive on digital

To set out on the path toward Digital Reinvention, telecom industry leaders can take four initial steps: Envision possibilities, create pilots, deepen capabilities and orchestrate ecosystems.

Step 1: Envision possibilities
Conduct envisioning sessions for both DSE partners and DSP customers based on design thinking to produce a definitive reinvention blueprint. For example, use deep conversations and in-depth marketing analysis to develop a better understanding of customer needs and desires, and brainstorm new ways to enhance engagement. Incorporate external stakeholders in these sessions, including customers, to encourage thinking that goes beyond business-as-usual. Set ambitious goals, such as a 50 percent cost reduction, not just 5 percent.

Step 2: Create pilots
Develop prototypes using agile development, test them with customers and get them to market quickly to promote feedback and iteration. Establish communities of interest to create safe environments to beta test innovations, and incorporate them as a central part of design and development processes.

Step 3: Deepen capabilities
Augment digital capabilities with strategic initiatives, and continue to build and deploy necessary applications aligned to the target Digital Reinvention operating model, platform and ecosystem strategy. As pilots evolve, impediments to development will emerge, highlighting limitations in existing capabilities. Adopt a continuous, iterative strategy to address limitations by building new or extending existing capabilities.

Step 4: Orchestrate ecosystems
Embrace a strategy based on holistic reinvention rather than a series of point solutions. Maintain a clear focus on the needs, aspirations or desires of customers and clients, such as partners, and colleagues, such as service providers. Focus on ecosystems to expand and align a broader set of capabilities, and to help create and deliver on customer promises.

Key questions

- How can you make your digital strategy more ambitious to face disruption head-on?
- How do you make your telecom organization more agile and secure, so it is better equipped to respond to unexpected challenges and opportunities?
- What steps can you take to make your workforce open and flexible, and more risk-aware?
- How can you help your telecom leadership become more visionary, conceiving what customers want before they know it themselves?

Vodafone AI chatbot transforms the customer experience

United Kingdom-based Vodafone developed a chatbot, "TOBi," to provide customers with a quick-and-easy web chat service. TOBi, an AI engine within the new My Vodafone in-app messaging service, can handle a range of customer queries, including device troubleshooting, usage and order tracking, among others. Messaging technology from LivePerson and Watson AI capabilities power the chatbot. By determining meaning, tone and intent of a set of words, TOBi has been able to understand what the customer needs more than 90 percent of the time. TOBi can then provide both simple and complex answers, and even help make the necessary account changes.[22]

Related reports

Berman, Saul J., Peter J. Korsten and Anthony Marshall. "Digital reinvention in action: What to do and how to make it happen." IBM Institute for Business Value. May 2016. https://www-935.ibm.com/services/us/gbs/thoughtleadership/draction/

Berman, Saul J., Nadia Leonelli and Anthony Marshall. "Digital reinvention: Preparing for a very different tomorrow." IBM Institute for Business Value. December 2013. https://www-935.ibm.com/services/us/gbs/thoughtleadership/digitalreinvention/

Fox, Bob, Nick Gurney and Rob van den Dam. "Outthinking disruption in communications: The 2020 CSP in the cognitive era." IBM Institute for Business Value. February 2016. https://www-935.ibm.com/services/us/gbs/thoughtleadership/2020csp/

Fox, Bob and Rob van den Dam, "Restoring connections: How telecommunications providers can reboot the customer experience. IBM Institute for Business Value. January 2015. https://www-935.ibm.com/services/us/gbs/thoughtleadership/restoringconnections/

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Notes and sources

1 IBM Institute for Business Value. Global Ecosystem Survey. 2016. (Unpublished data.)

2 Ibid.

3 Ibid.

4 Finley, Klint. "Google Fiber just swallowed up another internet provider." Wired Business. June 2016. https://www.wired.com/2016/06/google-fiber-just-swallowed-another-internet-provider/

5 Kelly, Heather. "Facebook to beam free internet to Africa with satellites." CNN Tech. October 2015. http://money.cnn.com/2015/10/05/technology/facebook-africa-satellites/index.html

6 IBM Institute for Business Value. Global Ecosystem Survey. 2016. (Unpublished data.)

7 Ectors, Maarten. "When will traditional telco business start dying? Afterwards Telco 2.0 or Google and company?" LinkedIn blog. December 2016. https://www.linkedin.com/pulse/when-traditional-telcos-start-dying-afterwardstelcos-20-ectors/

8 Miller, Chance. "The new wave of 'unlimited' data plans: How Verizon, Sprint, T-Mobile, and AT&T compare." 9To5Mac. February 2017. https://9to5mac.com/2017/02/19/the-new-wave-of-unlimited-data-plans-how-verizon-sprint-t-mobile-and-att-compare/

9 Lukman, Enricko. "Line Hits 200 Million Users, Adding 100 Million in Just 6 Months." Techinasia. July 2013. https://www.techinasia.com/line-hits-200-million-users-adding-100-million-users-6-months

10 Gupta, Deepali. "Messaging app that works without data connection gains ground." ET Telecom. February 2016. https://telecom.economictimes.indiatimes.com/news/messaging-app-that-works-without-data-connection-gains-ground/51134554

11 Handy, Alex. "Twilio unveils new API, tools for simplifying telephony Apps." The New Stack. May 2017. https://thenewstack.io/twilio-embraces-trends-new-api-capabilities/

12 "Survey Shows 75 Percent of Consumers Would Buy Mobile Services From Amazon, PayPal and Netflix." MATRIXX Software. October 2017. http://www.matrixx.com/press_release/survey-shows-75-percent-consumers-buy-mobile-services-amazon-paypal-netflix/

13 Handley, Lucy. "Facebook and Google predicted to make $106 billion from advertising in 2017, almost half of world's digital ad spend." CNBC. April 2017. https://www.cnbc.com/2017/03/21/face-book-and-google-ad-youtube-make-advertising-in-2017.html

14 Gentlemen in China. "WeChat: Chinese App signals future of e-commerce." Marketing to China. January 2017. https://www.marketingtochina.com/wechat-chinese-app-signals-future-e-commerce/

15 Meyer, David. "Tencent is now the most valuable company in Asia." Fortune. September 2016. http://fortune.com/2016/09/05/tencent-most-valuable/

16 "Sigfox boosts its IoT global footing, achieving national coverage in 17 countries, and expands into four new countries." September 2017. https://www.sigfox.com/en/news/sigfox-boosts-its-iot-global-footprint-achieving-national-coverage-17-countries-and-expands

17 Carpenter, Shelby. "5 Key Things To Know Before You Switch To Google's Project Fi." Forbes. September 2016. https://www.forbes.com/sites/shelbycarpenter/2016/09/27/revew-30-days-google-project-fi/#740ff25d1625

18 "AT&T completes acquisition of DIRECTV." AT&T press release. July 2015. http://about.att.com/story/att_completes_acquisition_of_directv.html; Poletti, Therese and Trey Williams. "AT&T will use Time Warner merger to expand its bundling strategy." MarketWatch. October 2017. https://www.market-watch.com/story/att-will-use-time-warner-merger-to-expand-its-bundling-strategy-2017-10-25; Gilbert, Mazin. "AT&T's Gilbert talks virtualization." Telco Transformation. October 2017. http://www.telcotransformation.com/author.asp?section_id=401&doc_id=729457; Sverdlik, Yevgeniy. "One-Third of AT&T's Network is Now Virtualized." Data Center Knowledge. January 2017. http://www.datacen-terknowledge.com/archives/2017/01/05/one-third-atts-network-now-virtualized; "A Network Built In Software." AT&T blog. http://about.att.com/innovation/sdn; Arnason, Bernie. "Embracing and retraining for innovation: AT&T strategy aims to disrupt itself Part II." Telecompetitor. October 2016. http://www.telecompetitor.com/embracing-and-retraining-for-innovation-att-strategy-aims-to-disrupt-itself-part-ii/

19 Frisiani, Guido, Jay Jubas, Tomás Lajous and Philipp Nattermann. "A future for mobile operators: the keys to successful reinvention." February 2017. https://www.mckinsey.com/industries/telecommuni-cations/our-insights/a-future-for-mobile-operators-the-keys-to-successful-reinvention

20 Essentials2020, Orange's new strategic plan." Press Release Orange. March 2015. https://www.orange.com/en/Press-Room/press-releases/press-releases-2015/Essentials2020-Orange-s-new-strategic-plan; "Digital Transformation Initiative Telecommunications Industry." World Economic Forum. January 2017. http://reports.weforum.org/digital-transformation/wp-content/blogs.dir/94/mp/files/pages/files/white-paper-dti-2017-telecommunications.pdf

21 Krishnan, Vina. "Reliance group launches Unlimit IoT services in India." Telecom Lead. November 2016. http://www.telecomlead.com/telecom-services/72634-72634; "Reliance's Unlimit, IBM collaborate to power IoT innovation in India." The Asian Independent: United Kingdom. September 2017. https://www.theasianindependent.co.uk/reliances-unlimit-ibm-collaborate-to-power-iot-innovation-in-india

22 "TOBi or not TOBi? AI is transforming the customer experience." Your Ready Business. August 2017. https://www.yourreadybusiness.co.uk/tobi-not-tobi-ai-transforming-customer-experience/

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