TRANSFORMING
TOWARDS
DIGITAL BUSINESS
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The world is now in the midst of a far-reaching, rapid, and crucial change called digital transformation. Driven by digital technologies, this is a process that is revolutionizing and redefining our world. Digital technology advances include sensor technology development, which enables cost-efficient and wide-range data collection. It also comprises technology for artificial intelligence, machine learning and big data to help enterprises translate massive non-structured data into rules and decisions. The Internet of Things (IoT) and cloud technologies make decentralized data analysis and usage a digital era reality.

Lastly, it also consists of, but is not limited to, manufacturing technology improvements in such fields as nano techniques and 3D printing, which facilitate dispersed, small-scale manufacturing.

Acquiring, using and sharing information become more open and efficient with digital technologies. New business models and ecosystems are being shaped and traditional industries are being urged to adapt to the disruptive new technologies that are changing the way people live and work. Digital technologies are reshaping global economic structures and are altering the basis of industrial and economic competition. Digital technologies help enterprises open new sales channels, drive sales growth, create new products and services, and improve customer experience.

The digital trend is rewriting business rules and restructuring global economic development. With emerging technologies and applications undergoing rapid development, a fully-connected world is gradually becoming a reality. The new market landscape is one in which success comes not from battling competitors, but from creating a 'Blue Ocean', of untapped new market spaces that are ripe for growth. Today, the 'Blue Ocean' market is evolving into a growth engine for operators, and injecting new momentum into economic growth. According to Accenture research, digital technologies will contribute US $527 billion to China's GDP by 2020.

Telecom operators across the globe are addressing digital transformation at full force; digital transformation being the way to secure strong advantages over competitors as they continuously develop. Only digitalized enterprises can achieve significant improvement in customer experience and business efficiency and stand out among competitors. Enterprises that sit by idly as the world around them changes will be squeezed out of the market.

With digital transformation, many enterprises remain unable to resolve the time-sensitive issue of seizing the opportunities that come from gaining first-mover advantage and the dividends of a digital era. The bottom line is that digital transformation for most enterprises is a long and laborious process.

In the 'Blue Ocean' that thousands of operators must navigate - the ICT industry faces unprecedented growth opportunities. ICT technologies are already strategic focal points in today's comprehensive international competition. In terms of market potential, digital services are set to create massive connections and tremendous market value for the future.
Huawei Rotating CEO Eric Xu on Enabling Telco Transformation

Huawei was founded in 1987. In 2011, it began to expand beyond its telecom operator business into the enterprise and consumer spaces. Since then it has evolved from a telecom equipment vendor into a leading global provider of information and communications technology (ICT) solutions, with its products and services reaching almost every corner of the globe. In 2015, the company’s sales revenue hit US$60.8 billion (CNY395 billion), of which 58% was from outside of China.

At the National Science and Technology Innovation Conference held in Beijing last May, Huawei CEO Ren Zhengfei predicted that the company’s revenue would soar to US$150 billion by the year 2020. While this revenue target is acting as a new spur to increased effort within Huawei, it also brings with it new challenges. Over the past few years, the telecom industry has come under great pressure, as the fast-growing OTT industry has chipped away at telecom markets. Threatened telcos are in dire need of end-to-end digital transformation. (OTT: over-the-top, refers to a business model whereby Internet service providers use telecom networks to offer applications and services directly to end users)

In early 2016, Huawei launched its All Cloud Strategy, which focuses on ICT infrastructure. This strategy positions Huawei as an enabler of both the intelligent world as well as enterprise cloudification and digitalization. Its goal is to help its partners achieve digital transformation, digitalize their operations, and deliver a ROADS experience – a Huawei concept that stands for Real-time, On-demand, All-online, Do-it-yourself, and Social. Eric Xu, one of Huawei’s Rotating CEOs, says, “We’ve got to work with telcos to get over this hump. This is the only way to open up new space for telco growth, and to realize the changes promised by the digital world.”

On September 28, 2016, Harvard Business Review China (HBR China) interviewed Eric Xu at the company’s headquarters in Shenzhen, China. Dr. Xu spoke very frankly, addressing each question directly and logically, with a strong grasp of the details. The interview concentrated on a single topic: telco transformation.

End user satisfaction drives everything

HBR China: Many Internet companies born in the cloud have appeared over the past decade. They deliver a premium user experience and innovate through rapid iteration. These companies have transformed the business models of many vertical sectors, and represent a significant shock to the telecom industry. What is the state of the telecom industry today?

Eric Xu: The entire telecom industry is under pressure to transform. This pressure comes from stakeholders’ demand for a better experience, and from the ecosystem. There are six aspects worth noting.

First, consumers think that data services are too expensive and the experience is unsatisfactory. For enterprise customers, it often takes a month or more just to get a private line installed. Their needs for connectivity,
bandwidth, reliability, and security are still not being met.

Second, Internet service providers use telecom networks to serve their customers, but they think they are paying too much for bandwidth and data traffic throughput. This is a global problem.

Third, governments are trying to cut the prices of telecom services. The EU is in the process of abolishing mobile roaming charges within Europe. The Chinese government is pushing for cheaper telecom services. Other governments around the world are trying to find ways to lower prices.

Fourth, telcos are having a hard time because growth and profitability across the industry are in a downward spiral.

Fifth, telecom equipment vendors are suffering because their fate is tied to that of telcos.

Sixth, investors are struggling due to the low returns on investment.

**HBR China:** Then what is the way forward?

**Eric Xu:** There are only two options: The industry either takes action to resolve these issues, or it lies down and waits for others to send it the way of the dinosaurs. Obviously, telcos are at the heart of the industry. The telecom industry can only become healthy when telcos themselves are healthy. In the same way, the industry can only complete its digital transformation once telcos have successfully gone digital. The situation is urgent: Google and Facebook are trying to build entirely novel types of networks so as to bypass telcos and deliver services directly to their users. If this attempt proves successful, they could consign the entire telecom industry to the dustbin of history.

**HBR China:** What is the key to resolving these issues?

**Eric Xu:** Customer satisfaction is the key. Once issues around customer satisfaction are resolved, everything else will fall into place. But how can telcos ensure customer satisfaction? The key is a significant improvement in the user experience as consumers buy and use services.

In the past, telcos focused on experience mainly in terms of usage: how users were making phone calls, sending texts, or using the Internet. But customer satisfaction often also depends on their experience with gaining access to those services in the first place: finding out about the services, purchasing, making payments, after-sales service requests, and so on. Complicated procedures and long waiting periods before a new service is activated make customers lose interest. The ability to deliver a superior experience when consumers buy services is what sets OTT players apart from telcos.

**ROADS: goal of digital transformation**

**HBR China:** What is the key challenge to improving user experience at the purchase stage?

**Eric Xu:** The key challenge lies in whether telcos can engineer a user-centric digital transformation. The operations systems of almost all telcos today serve their own employees – the sales staff, and maintenance engineers. These systems have been digitalized, but they are still called “internal IT systems”. If telcos hope to future-proof their businesses, they must go beyond the digitalization of technologies and products. Telcos must become digital enterprises that are able to offer users a ROADS experience – namely Real-time, On-demand, All-online, Do-it-yourself, and Social – throughout the process of buying and using telecom products and services. Huawei has developed the ROADS experience model based on its own experience and the best practices of Internet companies. We believe that once telcos can deliver the ROADS experience, they can resolve all the issues that affect customer satisfaction. We can think of ROADS as the goal of digital transformation.

**HBR China:** What does it take to deliver the ROADS experience?

**Eric Xu:** Ubiquitous connectivity is the prerequisite. There are two sides to it. One is internal: Within the company, there must be ubiquitous connections between people, between things, and between people and things. The other side is external connectivity: The company must be fully connected to its users, customers, partners,
and suppliers.

**HBR China:** What value will ubiquitous connectivity create for telcos?

**Eric Xu:** First, it will help slash operating expenditure (OPEX) and boost efficiency. With ubiquitous connectivity, your purchase order for a supplier will flow directly into their systems, and you can gain visibility into the end-to-end supply process. Your users can also directly access your systems. You can even connect your IT systems with those of partners. This will greatly reduce your OPEX and maximize efficiency. Based on our experience with the Honor brand (a Huawei brand that can be entirely purchased online), we believe ubiquitous connectivity can reduce OPEX by at least 10%. For telcos, a 10% reduction in OPEX will deliver immediate improvements in profitability.

Second, ubiquitous connectivity will foster innovation in operating models and business models. This will be vital to telcos’ digitalization strategies, because it represents long-term value.

**Innovation and transformation of operations systems**

**HBR China:** Are telcos’ existing operating models and business models outdated?

**Eric Xu:** Let’s look back at what telcos have done. They have been taking a long, hard look at Internet companies, and they have launched numerous applications to specifically compete with these companies. But these applications have not performed as they hoped. I think the fundamental cause is that their operating models can hardly support Internet products. Their DNA, technology architecture, and operating models are not Internet-based. Even if they copy the way the Internet companies make products, they are highly unlikely to succeed.

**HBR China:** Why don’t Internet products fit well into telcos’ existing operating models?

**Eric Xu:** Telcos’ organizations and systems are old-fashioned and technology-centric. Barriers have built up between their marketing, network management, and IT functions, and their front-end and back-end systems are not integrated. By contrast, Internet companies keep their eyes fixed on their users, and have streamlined their organizations to rapidly respond to user needs. As a result, a product that takes Internet companies a few months to develop and launch, might take one or two years by some telcos. With such a long time-to-market, telcos can hardly stay ahead of the competition in the Internet era, where everyone is fighting for rapid iteration and innovation.

**HBR China:** So transforming operating models is crucial to realizing the ROADS experience.

**Eric Xu:** Changing the mindset is important. Telcos need to learn from Internet companies, including their approaches to design, operations, and technology architecture. They need to overhaul the operating models of the telecom industry in the following three ways.

First, they need to shift the focus of their operations from the “network experience” to the “user experience”. At present, the user experience is often measured solely based on network performance indicators such as bandwidth, latency, and packet loss rate. In the future, telcos should look to the end-to-end user experience, from how users find out about telecom offerings to how they buy them and obtain after-sales services.

Second, telcos need to introduce real-time, autonomous systems to replace human-operated systems. As telcos get better connected, they will be able to make their operations simpler, more efficient and more intelligent, by building big data and AI systems that support real-time decision making.

Third, telcos need to evolve their closed IT architectures to a cloud-based, Internet architecture. Cloudification must be agile, intelligent and open, so that telcos can effectively connect their internal and external operations systems and create a robust ecosystem in which telco staff, customers, partners and suppliers can collaborate efficiently and openly to share success.

**HBR China:** What will future operations systems look like?

**Eric Xu:** First, they will no longer be internal IT systems or support functions. They will become production systems. An example is our Honor brand: Our online store directly engages with our customers. After the customer places an order online, the order is transmitted directly into our production line and, once the product is ready, it is shipped directly to the customer.

Second, future operations systems will be entirely user-oriented and fully open.

Third, how good an operations system is will not be judged by the telco itself, but by its users.

**HBR China:** Is the transformation of operations systems the key part of telcos’ transformation journey?

**Eric Xu:** Yes. Digital transformation necessitates changes to telco systems, organization, processes, and culture, and that will take a long time. Telcos face two roadblocks on their digital journey.

The first roadblock is the conflict between the long-term transformation and the need for short-term gains. Most telcos are public companies. When they grow...
rapidly, their CEOs get to stay in place for a long time. But when these companies run into difficulties, CEOs are replaced frequently, and this is very unhelpful for a long-term project like digital transformation. Digitalization involves changes to the organization, corporate culture, processes, and IT systems. It may also mean redundancies and recruitment of employees with new skill-sets. This deep re-engineering of a company takes at least 5 to 10 years.

The second roadblock is resistance from within the organization. Many of the largest telcos worldwide have generally followed a common development path. They started as monopolies and have since been split up into several companies. As a result, they have similar organizational structures, and their monopoly mindset and culture remain unchanged. These will stifle transformation. Thus far, there are very few telcos that are willing to put their heart and soul into transformation.

**Eliminating major obstacles**

**HBR China:** How can telcos overcome these two major obstacles?

**Eric Xu:** They will find it hard to surmount the obstacles on their own. Usually, there are only three or four telcos within a country. Even if the business environment is changing, so long as none of their competitors are committed to change, telcos can continue to get by without transforming themselves. So telcos need external enablers. Once one telco takes action and transforms itself successfully, the others will suddenly realize that they need to change as well. And they will be able to move quickly, because they can learn from the lessons and experience of the first mover, and use the knowledge and the pool of workers with new skills that the first mover has created.

**HBR China:** What specifically should telcos do?

**Eric Xu:** There are two key actions needed to overcome these obstacles.

First, the board of directors and CEOs must commit themselves to transformation, and use strong leadership to drive the initiative from the top down.

Second, telcos need the support of external enablers. Huawei's carrier business has positioned itself as a driver and enabler for telcos' strategic transformations over the next decade. We are bringing together the industry's best minds; we are preparing the technologies and expertise that telcos will need. Globally there are three to four hundred telcos, and most of them are our customers. We hope to be a partner for any telco that is committed to transformation. We will have the full set of end-to-end capabilities, from strategy development to execution, that telcos need in order to transform and become digital enterprises that can deliver the ROADS experience.

**HBR China:** What is Huawei's enablement roadmap?

**Eric Xu:** Our All Cloud Strategy, launched in early 2016, is essentially an enablement roadmap for telco transformation. Based on the ROADS experience model, we enable telcos to rebuild their telecom equipment, networks, services, and operations. This transformation will not only help telcos sharpen their competitive edge in new markets such as IoT, video, and cloud; it will also support the cloudification of networks and operations systems to make telcos more agile. Our enablement efforts will focus on three areas: expanding telecom networks to include more connections; increasing the traffic flow capacity across telecom networks; and transforming operating models to make telcos more competitive against OTT players.

**HBR China:** During this enablement process, what do you work on, specifically?

**Eric Xu:** We are currently working with several telcos. We don't perform big bang transformations. Instead, we make ongoing adjustments and improvements in specific areas, gradually stepping up investment and checking our progress to ensure that whatever we are doing is creating value. In practice, we focus on the following four key points:

First, solutions must primarily address small-scale, limited problems. Together we can use these solutions to pilot changes and quickly adapt them as necessary. We don't expect to create complete, fully-tested solutions by working with just one or two customers. We prefer to test different parts of our solutions with different customers. This is an ongoing process of learning and building up experience, and gradually the complete solutions emerge.

Second, the transformation of operations systems is a long process. It requires patience. Telcos should not expect their vendors to be able to immediately spit out a complete set of technologies, organizational architecture, corporate culture, and strategic solutions which they can simply plug in and achieve instant transformation. This is just impossible. Transformation is difficult, and it needs to be conducted one step at a time. Huawei is committed to helping our customers step up to the inherent challenges and progressively pick up speed, but we estimate that the process will take at least ten years.

Third, telcos should stay focused on the value of
transformation and close the loop by creating value with each change. It must be made clear to everyone that every change, no matter how small it is, can bring demonstrable value. By doing so, telcos can create Internet-based operations systems with cloud architecture to deliver a ROADS experience.

Fourth, the value and positioning of Chief Information Officers (CIOs) should be redefined. CIOs oversee information technologies and systems, and they support corporate goals through the adoption of IT. But I think CIOs should become CI3Os, with the I3 representing Innovation, Interconnection, and Information.

Redefining CIOs

HBR China: You mention the need to redefine the role of CIOs. This will clearly expand CIOs' duties, their influence on other executives and managers, and their weight within the organization. Why is this necessary?

Eric Xu: Let me explain the meaning of I3. The first I is Innovation. CIOs know more about technological changes than other executives. They have ICT expertise and understand cloud concepts and technologies, what benefits these technologies will bring, what the Internet model is, and how the company should sell products and deliver services following the Internet model. CEOs don't necessarily have this level of knowledge, so CIOs need to take on a bigger role. They are no longer the directors or managers of IT applications. They should become the major drivers, planners, and even enablers of transformation and innovation in operating models and business models. This change poses new challenges to CIOs: They need to convince CEOs about the need for transformation, and they must have the ability to help CEOs achieve transformation.

The second I is Interconnection: CIOs need to enable the interaction between the company and its customers and partners.

The third I is Information: It means CIOs must lead the cloudification of the company's IT architecture.

HBR China: Given this change in the role of the CIOs, how should relevant functions be merged?

Eric Xu: Under telcos' existing organizations, the CIO's role is to oversee operations, the CTO manages networks, and the CMO manages marketing. After the digital transformation, the CIO, CTO, and CMO will need to collaborate closely and streamline processes to set up a user-centric production system. Based on what we've seen, telcos usually start by merging the CIO and CTO roles into a CTIO.

HBR China: In recent years, Huawei has emphasized the building of ecosystems as well as complementary and collaborative partnerships. Over the next five to ten years, what key value will Huawei create as a member of its ecosystem?

Eric Xu: The unstoppable rise of digital business is the key trend. Therefore, companies have to build strengths within their ecosystems. Huawei is committed to being an enabler of the intelligent world. We will actively contribute to the cloud ecosystem, promoting openness, collaboration, and shared success. We will be the enabler and preferred partner for enterprise cloudification and digitalization. We will stay customer-centric and help all companies and other ecosystem players contribute their unique value to a robust ecosystem for All Cloud and digital business.
Enterprise’s Road to Success—Creating Digital Capabilities

Just as the steam engine fundamentally changed the course of human development, digital technologies, as manifested by big data, cloud computing, the Internet of things, and mobile Internet, are now disrupting the old world and reshaping a new one. These new technologies are creating a digital era in which everything is connected.

The new trend has been set. A fully connected world is driving the transition from an information society to a smart society. The cloud lies at the very center of this evolution as a key element of the new connected world.

The essence of big data lies in its forecasting capabilities and the disruptive changes that it brings, which would have been unimaginable even a few years ago. By unearthing insights from big data, business opportunities can be created.

The world is marching inevitably into the digital world and there is no way to escape it. Senior management would be wise to listen to their CIOs and CTOs and catch the wave of digital transformation early on. Joining the trend and building and improving digital capabilities to become a digital company is the way to build a competitive business for the future.

How does digital technology change our world?

Digitalization not only changes consumer behavior, it also redefines the boundary of industries and gives rise to new market landscapes.

First: Digitalization helps consumers make better informed decisions

In the digital age, consumer demands have moved from online and offline to scenes and fragmentation. Consumers interact and connect via digital technologies, receive and share information, make decisions and conduct transactions.

Due to changes in consumer purchasing habits, companies now rely on precision data mining and analysis, to acquire consumer information and market insights. This enables them to restructure demand-supply configurations, optimize the value chain structure, and develop new inventions and services.

Changing consumer behavior has modified the business landscape in many markets. Traditionally strong companies have lost ground or even become obsolete. Whole industries have struggled to adapt. Manufacturing, for example, is no longer the profitable industry it once was. It has been replaced by service industries in many advanced economies. To adapt to changing circumstances, companies have to comprehensively digitize and establish new teams that understand that the Internet can transition the company to a new business model. Thus, the conversion from customers to users and from sales to services across the entire business model, and the objectives of supply chain integration and rebuilding of the value chain and the ecosystem may be realized.

At the same time, the commercial model and market layout are transformed by digitalization as well. Research from Accenture shows that Chinese companies believe digital technologies can open up new sales channels, drive sales growth, create new products and services, and improve user experience. They believe data analyses, cloud technologies, mobile internet, and other digital technologies will play a vital role in future business growth.

Big data can create a fortune for companies and open up creative possibilities via precision data mining.
Second: Digital technologies revolutionize industry conditions

Compared with the past, digitalization also significantly reduces channel and R&D costs and allows for endless innovative means of marketing. Traditional marketing has “evolved” into the O2O+VAS (online-to-offline and value added service) experiential marketing. Through registration, consumption, record keeping, analyses, and circular guidance, companies may now describe user characteristics via analyses of relevant consumer data that facilitate further precision marketing and encourage customers’ repeated purchases.

Digitalization also makes innovation more convenient than ever. For example, in the taxi services industry, Didi, Uber, and Yedao have all made use of digital technologies and rapidly took up market share so that pressure on traditional service providers has increased significantly.

However, Google, Amazon, and Alibaba, companies designed for the data era, have all created another scenario for human society. To a large degree, they rely on internet and data technologies that help both sides of supply and demand to more accurately match and connect with each other, and improved operating efficiency. Behind the provision of outstanding digital experiences is their effective operation of digitalization.

Compared with other companies, it can be seen that digital transformation generates changes in or even overturns or restructures organizations, management models, and the operating model of a company. How to utilize new digital technologies to improve competitiveness and avoid becoming the next Kodak, becomes the focus for many industries today.

In this digitalization revolution, I have to mention the ICT industry, which, due to its own unique characteristics, is undoubtedly a pioneer and driver. As consumers go online and demand for the ROADS experience grows, the impact of OTT service replacements is also seeing explosive growth in network traffic. OTT services are putting operators under pressure and driving change in the industry.

On the other hand, how the ICT industry adapts to the digital era and transforms into data driven companies will play the leading and driving role in the transformation of all industries. For this, Huawei’s view is that an operator has to realize the ROADS experience to remain competitive, i.e. Real-time, On-demand, All-online, DIY, and Social. In order to support these new trends, a technological revolution is required for all commerce. At the same time, in-depth transformation of the ICT industry is also required so that it can maintain its leading position as the engine of modernization.

Digital technologies today are disrupting every sort of industry, and companies cannot simply wait and see the outcome. Businesses must move quickly to observe, study, and research, and then take decisive action to start the process of digital transformation. Thus, how a company finds the path of transformation is critical.

Three rules of digital transformation

For a company, particularly companies not previously driven by IT or Internet-based business, digital transformation is a challenging process and is not accomplished overnight. There are significant challenges and risks to face. However, this is not an excuse for refusing to change. To remain competitive companies must accelerate their transformation. Following are three rules of digital transformation for business:

Rule One - Satisfy new use demands and also create demand

As early as 1973, the father of modern management science, Peter Drucker wrote: “Satisfying demands of users is the mission and purpose of every company.” This is a self-evident truth. However, many companies, including some major names in business, get mired in internal process issues and ignore this basic rule of business. On the contrary, small street front stores clearly understand how to satisfy consumer demands, as the store owners have a more in-depth understanding of their customers than some large companies.

Today, there is a new driving force in the services field, premised on imaginative mining and capturing customers’ inner desires or aspirations. Behind big data, demand and supply chains have implicitly or seemingly emerged; whoever grasps the demand economy will grasp market opportunities.

Digitalization is gradually breaking down boundaries between industries. A future digital company cannot be limited to one field; it has to focus more on other fields, develop new growth areas, and create a demand chain to satisfy customer demands. For example, if you are in the retail industry, you
also have to pay attention to the development of the logistics and financial sectors, as all are interrelated.

In order to create user-centric experiences, a company not only has to integrate world-class technologies, but also must change its original organizational structure and processes, including the acceptance of digital transformation of the company by the management and ordinary employees, in order to improve understanding of its customer base. Only by doing so can a company realize long-term development in the digital economy.

Thinking change is also an important link in the chain of change; managers and employees all need to embrace a brand new way of thinking. Establishing data-driven thinking is another critical step, and there has to be real-time, specific classification of data so that the company can respond to competitors and leverage change in the industry. At the same time, the company must learn to move faster and faster.

Rule Two - Rely on big data, cloud computing, and the Internet of Things

The popularity of digital technologies allows almost every company to collect big data. How to pan real gold from data becomes a test of whether or not a company is equipped with digitalization capabilities. Although many companies collect more and more customer data, they may not be good at utilizing that data. Generally speaking, 98% of the data a company collects is dark data (dark data requires funds to store, protect and manage, but is not effectively utilized to improve commercial value). More importantly, such data is dispersed throughout many databases. It is very difficult for a company to have a complete view of customers. Thus, when users contact companies that truly care about customer service - that understand and satisfy customer demands - these companies will not be competitive because they lack a complete view of the customer.

If a company hangs on to the past and refuses to accept new things, it has no future. The earlier the digital transformation, the earlier a company may achieve competitive advantages and grasp new potential opportunities. This requires that a company have real-time and specifically classified data so that it can promptly respond to changes by competitors. For example, Adidas has opened physical stores in Europe, and utilized 3D scanning and 3D printing technologies to help customers customize running shoes. Sensor chips are placed in the shoes to collect data and improve products so that better services can be provided in the future.

In the digital transformation of a company, establishing cloud computing capabilities is an important step. In the past, a company’s software and data were in hardware devices and servers. All hardware resources could not be shared; the utilization rate was extremely low; a lot of resources were wasted. According to Wikipedia, a cloud computing service is, “An online application, which can be accessed from another Web service or software; the software and data it uses are all stored on the server”. This actually is a centralized platform, separating software from a certain specific server and realizing resource sharing among applications. The significance of cloud computing services is large. All software shares all hardware resources, which allows a company to reduce costs and improve efficiency and allows for better energy conservation and environment protection for the entire society. A Bain research report discovered that many Chinese companies are specifically stating that they are considering cloud computing solutions.

For a company to embrace cloud computing, internet support is indispensable, moreover since the internet continually increases the number of smart internet products, and the whole world enters into the era of “All Things Connected”. A management guru, Michael Potter wrote in “Harvard Business Review” that “in the past 50 years, IT technologies created two waves which deeply impacted competition and strategies of companies, and all things being interconnected by the Internet of Things is the third wave. In this wave, IT technologies are becoming an indispensable component of products themselves; these products are interconnected by the internet, and the efficiency of activities of a company will be greatly improved.”

Potter believes that the scale of the third wave may surpass the previous two waves, stimulate more innovation, and realize greater improvement of productivity and economic growth. In the past two or three years, almost all industries and companies around the globe became involved in the Internet of Things; it can be estimated that the popularity of the Internet of Things will definitely set off a huge wave of innovation. Particularly in the value chain of products in the manufacturing industry, the Internet of Things will definitely play a decisive role. Along with the rise
of this wave of innovation, companies can establish highly efficient, flexible, modular, automated, and intelligent plants. They can also discover new paths to successful transformation into a value-added service company utilizing cloud computing, based on solutions of the Internet of Things.

**Rule Three - Create a digital value chain and open an integrated platform**

The digital economy creates new business opportunities for companies, and these opportunities involve many aspects of the value chain. However, in order to grasp those opportunities, a company has to quickly and flexibly utilize data, because data is the driving force to promote digitalized operations and create value-added business results.

The current situation is that the value chain is supported by obsolete systems, disjointed processes, and scattered information; without a doubt, as a result, the company is at a competitive disadvantage. Moreover, the company will not be able to cover the end-to-end processes in multiple business areas or promptly make decisions; the disjointed processes will also further delay decision making. What is needed is for the company to create a flexible, digitized value chain internally. Such value chain also enables the company to integrate business processes and conduct commercial analyses in real time and thus to realize more intelligent, quicker, and simpler operations.

In terms of embracing cloud computing, digitized platforms constructed by companies should have two main characteristics, i.e. openness and integration. An open platform provides customers an alternative choice. As the cloud computing era evolves, more and more applications of a company will be based in the cloud, which also requires that the company’s cloud platform be transformed from being scattered to being integrated, and from being closed to being open.

It is worth mentioning that when constructing a digitalized platform, besides changes in concept and acceleration of actions, a company also needs to leverage help from external professional companies and operators. The role of operators is still important, as all industries will rely even more on channel once cloud computing is developed and traditional companies undergo digital transformation. Previously, a company’s IT data only needed to flow internally within the company. Now, in the cloud era, a more stable and faster operator network is required at all times and in all places.

As new technologies develop today, many digitalized companies are emerging, and that also pushes more traditional companies to undertake digital transformation. These companies may have already been exploring an effective way to improve innovation capabilities, realize digital transformation, and establish brand new business models. Companies should understand that digital transformation does not happen overnight, and that it is a long journey. However, companies should not delay; they should act immediately and, with the help of experienced partners, gradually establish digitalization capabilities and immerse themselves in the digitalization era as soon as possible.
The ROADS Experience
—Embracing Digital Transformation with an Open View

Advances in ICT technologies are blurring the boundary between the physical and digital worlds. This has impacts far beyond computing and communications technology; it affects and shapes how we live and think. For business, it’s clear that companies able to leverage this digital transformation will have a competitive advantage and achieve long-term success.

Liang Hua, Senior Vice President of Huawei and Chairman of Open ROADS Community

According to a 2015 user experience survey, more than 49% of respondents believed that online shopping delivers the best user experience compared with other industries such as radio, TV, telecommunications and media. The reason online shopping stands out is because it can best satisfy the five dimensions of user experience, i.e. Real-time, On-Demand, All-online, DIY, and Social at the same time. Satisfying these five dimensions, which can be abbreviated as ROADS, is why online shopping has emerged as the “most preferred” option among the available industries. Nevertheless, this research is alarming for Telco operators, as it means new pressure and challenges for their businesses. Telcos facing demand for the ROADS experience are looking to digital transformation as the ultimate goal for both operators and solutions providers.

Huawei’s challenge is to demonstrate how an operator can successfully deliver the ROADS experience for end users such as individuals, families and enterprises. At the same time, Huawei needs to develop a roadmap for helping operators navigate digital transformation, showing how it can be achieved systematically when aiming to deliver the ROADS experience.

Improving user experience and satisfying user demands in a timely manner has become the driving force for Telco operators in managing digital transformation. Operators must be able to understand end-user demands and customer experience by using an outside-in approach. By leveraging this as measurable metrics, they can transform their operating models and overhaul their legacy infrastructure more easily.

From the operator’s perspective, the driving force for digital transformation is to be able to quickly provide users with their favorite services, and the ROADS experience should set the standard for service in the consumption process - “purchasing-using-sharing”. A paradigm shift in their business operations and applications will mean fundamental changes for operators in their operating models and enabling platforms for ICT resources and business. At the same time, ICT infrastructure will need to adapt to changes in operations, migration to software-defined networking, virtualization, data-center cloudification and ultra-broadband. All of this aims to provide real-time, flexible, and scalable ICT resources for...
The process of implementing the ROADS experience for end-users does not happen overnight - nor will reconfiguration of operations and infrastructure. Implementation and optimization takes place via the accumulated learning of each customer experience and changes in operations and infrastructure.

To create the necessary guidance and improve the operability of the concept, Huawei took the initiative to establish the Open ROADS Community in 2016. We brought operators, solution providers, industry opinion leaders and analyst firms together and explored the future direction of digital transformation and user behavior. We helped to facilitate expert opinion exchanges and alignment of the ecosystem, so as to achieve our common goals.

At the first Open ROADS Community gathering in Singapore, 40 leading industry voices came together to discuss a wide range of pressing industry issues. The group discussed the challenges that the industry had yet to adequately address: the lack of defined objectives, consensus on methodology, frameworks to guide transformation, guidance and roadmap on evolution and the inability to assess the outcomes of existing digital transformation.

After fruitful discussions, three business taskforces were established: Universal Customer View, Service Landscape, and Master Digital Framework, all of which were interconnected. Universal Customer View aims to improve understanding of customer demands, while Service Landscape will re-define how best to meet those demands. The Master Digital Framework group is tasked with defining the business and ICT framework, identifying and closing gaps in business capabilities, activating new businesses and the ROADS experience, while optimizing return on investment for operators.

Conference participants envisioned new ecosystems for delivering customer experience, full channel management, operations management, data analysis and SDN/NFV. Based on the specific needs of each industry, the best solutions providers together with industry-promoting associations and partnerships will join forces to prepare the ecosystems needed to ensure success.

From concept to implementation, the Open ROADS Community will play the role of an ICT transformation incubator. For operators, the Community shares best practices, while offering the fundamental structures and operating models required for enterprises. The Community also strives to assist operators in completing their ICT transformation journeys and operations’ digitalization.

Recently, Huawei and HKT signed a letter of intent to create a strategic partnership in order to resolve customer challenges over the next five years. The partnership is an outcome of the research of the Open ROADS Community and learning experiences from other project implementations.

With a goal to promote openness for the public good, the Open ROADS Community advocates that all parties in the ecosystem collaborate more closely together.

First - Promotion of industry openness. The ROADS experience is applicable to various industries. Collaboration across industries is a key driver in order to deliver a better user experience for all end users.

At the Singapore Conference, a great deal was learned from one of the participants, Grab, a travel tools and reservation services provider. While most companies are still using GPS data to predict location-based changes in market demand and supply, Grab
is taking the lead in providing similar free data from its vehicle fleet to Open Traffic, a company under the World Bank. Thanks to open attitudes like this, data can increasingly be used to bring the progress of digitalization to a wider range of industries - to solve more underlying problems in our society.

Second - Openness to partners in the ecosystem. The establishment of an ecosystem creates value and opportunities for all the participating businesses. Experience tells us that by sharing capabilities via APIs with partners in the telecommunications market for example, more new, innovative and valuable services are created. Such services would be difficult, if not impossible, to implement outside of an ecosystem context.

Third - Openness to industry organizations. To promote industry development, trade associations such as GSMA, TM Forum, The Open Group as well as the Open ROADS Community can together play an important role in promoting broader industry consensus on digital transformation.

Fourth - Openness to cloud laboratories for innovative incubation and validation. The objective of the Open ROADS Community is to incubate best practices. To meet this end, Huawei is committed to opening up cloud laboratory resources for validation of Open ROADS Community projects. We believe in keeping our minds open to the future possibilities - Huawei hopes that service providers will be able to open up their production environments for project validation and implementation.

Driving demand for the ROADS experience are the digital natives of the Millennial generation. They represent a massive market segment on the rise, but even within their demographic, there are huge discrepancies with ages ranging from 19 to 35. Consider the range of income levels, consumer behavior, preferences for communication, and content consumption across that demographic.

A comprehensive understanding of consumer needs should be the basis which operators use to drive their digital transformation and optimize their operating models, as well as to reengineer their infrastructures and resources.

It's difficult to imagine how digitalization and ICT technologies will shape our world. But we believe that by continually improving users’ ROADS experience, improving service delivery response, transforming operations and infrastructure, and adopting a more open-minded approach, we can create a better connected world.
Embracing Digital Business to Explore the Digital 'Blue Ocean'

In the 15th century, mankind entered the Age of Discovery. For the first time, previously isolated continents and civilizations around the world began to connect. Later came the Renaissance and Industrial Revolution, and over a few short centuries humanity witnessed the unprecedented progress that shaped the modern world.

At the turn of the 21st century, a new type of human progress came to the fore. The still infant internet began to make mankind’s complete repository of knowledge accessible to the world. Information, if not wisdom, connected the digital and physical worlds in real-time – opening a new horizon for human history.

Jim Lu, President of Global Technical Service Dept, Huawei

The Age of Discovery changed mankind’s view of the world, altered trade patterns and established trends towards empire building and conquests, which brought with them unintended consequences both good and bad, such as the spread of smallpox to the Americas and the introduction of new food staples from the Americas to the rest of the world (ex.: like potatoes and corn). In much the same way, the Internet Age is also changing the rules of how the world operates.

What changes did the internet bring to the common consumer?

Festive greetings via phone and text messages during China’s Spring Festival have silently been replaced by WeChat groups and red packets.

In the past, we could only passively admire movie stars on TV programs. Nowadays anyone can become an internet sensation from their own living room; some people live-stream to share knowledge, some people live-stream for meaningful causes, others just live-stream about their normal day-to-day activities such as eating and sleeping.

Pokémon GO, a classic Nintendo game, a hit with kids in the 1990s, was given new life via the internet, whereby the augmented reality game Pokémon Go is now attracting people around the world to walk the streets collaborating together to capture fictitious monsters.

In the past, we queued for doctor appointments, for restaurant seats and taxis. Now, although we are still queuing up, the internet has even changed how we queue. Young people now place themselves in “virtual queues” at home, simply by tapping their smartphones.

Along with the growing numbers of users who depend on the internet, comes an ever-increasing demand for richer and fuller digital services. In addition, users want a more Real-time, On-demand, All-online, DIY and social experience. This is what Huawei describes as the ROADS experience.

Development of popular new services for consumers is rampant and becoming increasingly unpredictable, which places strains and new demands on carrier networks. For example, the number of viewers watching the video streaming of Chinese vlogger Papi Sauce’s social commentary was over 20 million at its peak, and the cumulative number of playbacks has exceeded 80 million. As a result, many users complained about video glitches, poor visual
quality and an inferior user experience. As this sort of situation becomes more common, it is clear that end-to-end platforms and network resources need to be optimized quickly, to provide an acceptable quality digital service experience.

In some places in China, patients' medical case histories, requiring access by any hospital in the country, are stored in the cloud via cloud computing technologies. This allows doctors to conduct real-time analysis and diagnostics modeling, based on a patient's medical history. As the Chinese government is now a strong advocate of cloud-based services, the annual compound growth rate of government cloud services currently exceeds 60%. Operators must carefully devise the optimal solutions that will ensure secure, reliable and smooth migrations to the government cloud, by tapping into advanced network capabilities to create value-added services.

Moreover, along with the development of cloud computing and IoT technologies, the focus of innovation is in many cases returning to traditional industries. Vertical industries can now be efficiently upgraded by riding on internet-enabled development initiatives such as Internet Plus, Industry 4.0, Internet Education, or Internet Finance.

All of the above-mentioned are now common occurrences - Operators must quickly push through digital transformation to catch the 'Blue Ocean' opportunity.

Digital transformation is a hot topic for today's telecommunications industry. But what does digital transformation actually mean for an operator? It's much more than deploying a website, an app, or certain digital technologies. It is, in fact, a systematic transformation of a company to stay competitive in the digital economy.

**Establish a clear business vision and strategy:** Construct a new customer-centric, experience-driven business model with business capabilities, and then maintain sustainable growth.

Before embarking on the journey to explore the Digital Blue Ocean, we must identify potential business opportunities. For instance, if an operator strives to become an enabler of digital service platforms, it needs to create a new operating platform to make its third party digital services more agile. It may also need to expose telecommunications capabilities and resources to partners and developers, as well as consider novel revenue-sharing business models.

New business models require operators to undergo comprehensive transformations across the entire company: How the company is organized, how it acquires and manages talent, its processes, operational systems and ICT infrastructure. The company may also need to establish comprehensive digital business capabilities such as managing customer experiences across omni-channels, coordinating with its internal departments, as well as collaborating with third parties and driving faster time-to-market. Operators also need to improve their abilities in the areas of security, finance, organizational performance review and corporate culture.

Operators have begun to realize the importance of striving to be "customer-centric and experience-driven". Reports show that over 68% of operators consider customer experience management as the strategic focus of transformation, and are committed to providing users with the best possible digital business experience as well as their experiences throughout the entire consumption processes, including buying, using, and sharing.

**Organization and Talent Transformation:** It plays an extremely important role in sustaining a company's digital transformation. Oftentimes, this is the most difficult part.

Speaking of talent, there are many ways to break down the barriers between departments within a company. One method, for example, is to establish a new customer-centric organization and to coordinate KPI reviews. Organizational transformation can result in mismatching the skillsets of existing employees. So it is important for management to ensure that employees are kept abreast of changes and that the company introduces IT and cloud technologies to build and maintain the knowledge structure it requires to remain competitive.

For example, with regard to the new positioning of the role of CIO - Besides driving the corporate IT system to the cloud structure and interconnecting customers, partners, and internal departments via the IT systems, the CIO also has to consider how to introduce the internet experience and innovate both the operating and business models. Taking this a step further, more and more telecoms operators are considering integrating the functions of CIO and CTO to create a new role – that of CTIO - to navigate the changing market landscape.
Talent organization transformation is not always smooth sailing, as it can be met with resistance from stakeholders. The biggest challenge of the revamp is how to balance their various interests during the course of transformation. Whether or not the transformation can be successful lies in the determination of the CEO and the management team. What they need is strong and powerful internal leadership that can drive transformation of the company with a top-down approach.

Operations Transformation: Build agile and innovative operations processes and systems, and realize faster time-to-market, to provide users with the inspired digital business experience and a full life-cycle experience.

When it comes to operations processes, an operator’s core business processes have to be customer-centric. Simplifying and automating management operations processes, in particular, those related to customers, are key to improving the customer experience.

Operations systems can no longer remain as supporting systems used exclusively by internal employees, but will instead be transformed into business systems with customer interfaces. The next generation operations systems will be open, intelligent and agile. Business Support Systems (BSS) will have to improve business agility, while Operations Support Systems (OSS) must orchestrate ICT infrastructure with flexibility and automation. For end users, next generation operations systems will be “e-commerce” enablers, where users are able to purchase products and services provided by operators, as envisioned by ROADS. Besides, from the viewpoint of operators, the next generation operations systems form the “development platform” that will enable the integration of the operators’ assets into products and solutions for customers. If you ask partners, the next generation operations systems will represent “channels” and “customized development platforms” for them to leverage. Content providers and software developers will be able to process sales transactions over the operator’s platforms, whereas software suppliers and system integrators will be able to develop customized systems and integrate them via the same platforms.

Infrastructure transformation: Build cloudification and software-defined ICT infrastructure to improve automation and scalability.

In order for operators to truly realize the ROADS experience and achieve agile operations, network infrastructure will have to be transformed into a software-defined network, to ensure real-time connection to the operations systems. The overall network structure will be data center centric and all network functions and business applications will be run in cloud data centers. This can be achieved by leveraging SDN (software-defined networking) and NFC (network functions cloudification) to accelerate the cloudification of network infrastructure, in turn improving the capabilities of automation and scalability.

The network is the core asset for an operator. During the transformation, the key question is how to maximize the current network assets to ensure that it’s a gradual evolution instead of a revolution. Evolution will become the new norm.

All in all, an operator has to carry out a well-coordinated transformation in terms of business, organization, talent, operations and infrastructure, in order to stay competitive in the world of the Digital Blue Ocean. However, for individual operators that are operating in a fragmented market, it is very difficult for them to singled-handedly resolve all the challenges and difficulties they’ll face.

As an international player in the carrier market, Huawei will leverage its global competitive edge to empower operators. We have announced “All Cloud” strategies that will help realize the full promise of the ROADS experience. We will also help operators establish competitiveness in new market opportunities, such as video, IoT
and cloud services, while promoting network cloudification and operations systems. These will help operators establish a competitive advantage through business agility and to achieve business success.

Supported by open cloud labs, consulting and system integration services, Huawei helps operators to implement their business strategies under our notion of being "open, evolving, and innovative".

"Open" -- In a spirit of true open mindedness, Huawei will work closely with industry partners to develop a collaborative ecosystem platform and to link the businesses of other industry players. By telecommunication capabilities exposure to partners and developers, we will be able to construct an end-to-end, multi-vendor verification environment.

"Evolving" -- Through Network 2020 planning and design services, Huawei can help operators formulate business and technological strategies, assess their existing capabilities, and do solution planning. We can also help them to jointly conduct solution pre-integration and pre-verification. This can help operators to quickly clear uncertainties by trial-and-error, as well as accelerate transformation and process standardization.

By introducing existing networks into cloud laboratories, we can ensure that each evolutionary step can focus on creating business value for the customer, improving revenue, reducing costs, and ensuring the smooth evolution of the network upgrade.

"Innovative" -- Through joint innovation, Huawei can help customers make their business operations more agile, accelerate product development, and realize precision resource re-allocation.

Rome wasn’t built in a day. The digital transformation of an operator is a long and complex process. It is very difficult for individual operators to complete the entire transformation single-handedly. What they need is a strategic partner that thoroughly understands operators’ businesses and market landscape and is able to collaborate closely with them. Different operators may have different strategic approaches to the transformation, so Huawei will provide customized business solutions to help them return to the top of the value chain.

• For network guarantors, through the Network 2020 planning and design services by Huawei, operators can develop video and other basic services, as well as provide flexible and scalable infrastructure.
• For service platform enablers, via Huawei operations platforms, operators can realize telecommunications capabilities exposure to developers and partners, digital service convergence, and finally create an open telecommunications ecosystem.
• For full service providers, we help operators to quickly provide consumers with digital services via agile operations, and provide enterprise customers with secure, reliable, localized, and one-stop cloud services, as well as enable vertical industries to complete their digital transformation via cloud computing, IoT, and other ICT technologies.

Huawei strives to be a strategic partner for operators throughout the digital transformation process. Together, let us embrace digital business and sail through the trillion-dollar Digital ‘Blue Ocean’!
Customers Now **Delighted** with Ubiquitous Consistent Experience

HUAWEI SmartCare® Omni-Channel Management provides end user with a consistent, personalized and contextually relevant experience across all traditional and digital channels. This is accomplished by leveraging consistency of information, while respecting customer privacy and aligning the Operators’ IT with their business strategies.

Learn More From IDC Webinar
Network Experience Creates Value
China Mobile (Sichuan) Network Experience PLUS

In today's 4G/5G era, networks support more traffic and services than ever. Increasingly diversified services and demand for a better user experience means that operators must develop high-quality networks if they aspire to be the market leaders. Operators understand that the users' network experiences are based on their experience with a specific service at a specific place and time. User experience also affects user behavior, in turn affecting operators' profits. Therefore operators compete on network quality. Against this backdrop, China Mobile's Sichuan Branch has blazed a path for high-quality networks that are up to this challenge.

Zhao Dachun, General Manager of China Mobile Sichuan Branch
evolution and network coordination to develop large-capacity smart pipes, fostering industry-leading technological innovations.

**Precise Investment with the Excelsior Method**

Transforming LTE networks into precise networks is inevitable. This precision concept is the guiding principle behind China Mobile (Sichuan) and Huawei’s collaboration to implement comprehensive planning and precise investment. Both companies are jointly deploying networks with a new LTE-intensive coverage model featuring large, medium, and micro capacity. They precisely locate weak coverage areas using High Precision Coverage Evaluation, based on big data analysis. Having tripled precision, work efficiency has improved significantly. With these experiences, both companies have been able to discover deeply buried, intensive coverage problems and ensure a leading role for LTE intensive coverage. Both companies are also continuously upgrading LTE technologies. In July 2015, they deployed the first carrier aggregation (CA) high-speed network in Sichuan. This network uses multiple new technologies, such as uplink 2-carriers aggregation, 64QAM, and downlink 3-carriers aggregation, aggregating multiple sub-carriers to deliver broader bandwidth, breaking through the uplink and downlink bandwidth limitations of typical LTE networks. These technologies allow the maximum downlink rate to reach 330 Mbit/s, providing mobile users with an uninterrupted internet connection that is faster than ever before.

**Commercial Acceleration: LTE+VoLTE**

To provide more users with VoLTE services, China Mobile (Sichuan) has been in a race against the clock to be the first to deploy an LTE high-quality network, speeding up communication services. On March 23, 2016, China Mobile (Sichuan) announced official commercial deployment of LTE networks with VoLTE (HD voice services), to provide all users in Sichuan with communication services featuring fast and clear audio and video calls (720p). VoLTE improves traditional phone calls, messaging and social interaction, supporting services such as HD video, Multi-Party Call, and multimedia messaging, for a better instant messaging experience. Since VoLTE was deployed, the number of users has skyrocketed. An average of more than 200,000 users have been registering with the service each day, and the average daily VoLTE traffic volume has exceeded 75 thousand Erlang.

**Innovation Delivering a Superior Video**
Experience
Since the end of 2015, China Mobile (Sichuan) and Huawei have been jointly developing vMOS-based networks and have developed the first ever construction plan for a vMOS-based network for mobile phone video services. The plan is user experience-Centric and E2E-based. It encompasses the world’s first vMOS-based mobile video experience baseline and a mobile video planning methodology based on four factors (trend, periodic, burst, and random data) and eight elements (video bitrate, RTT, RSRP, SINR, CQI, PRB, spectral bandwidth, and active subscribers) of the random forest algorithm. It also includes an optimization solution containing three elements (source video quality, initial buffer, and frame freezing) and six segments (UE, radio access network, transport network, core network, content delivery network, and SP network) for E2E mobile video services. At present, the deployment of the world’s first vMOS-based video network has been completed and verified using FOA. The network provides all users in Sichuan with a superior mobile video experience that features no waiting, no distortion and no frame freezing, leading Sichuan users into the new mobile video era. In the Sichuan mobile pilot region, the HD video vMOS has increased from 3.15 to 3.8 and traffic has increased from 3.424 TB in February to 14.848 TB in June, an increase rate of more than 300%.

The Past as Prologue
Facing a future environment that is both complex and ever-changing, China Mobile (Sichuan) believes that opportunities co-exist along with the inherent challenges. The company is confident in its development plans and strategies and is committed to implementing transformation and adapting to the industry’s new norm. China Mobile (Sichuan) will continue to support building a country with quality networks, improving user value, enhancing core competence, promoting reforms and breakthroughs, maintaining LTE advantages, and exploring new areas of development.

In the future, China Mobile (Sichuan) will measure and manage experience. The company is dedicated to improving network quality and innovating services continuously, based on user experience. It will leverage its network experience to forge high-quality networks, promote major LTE network development, and drive the increase of bandwidth and value. Finally, the operator will strive to manage traffic, provide digital services and promote reform and innovation.
Digital Operator
Enabling Digital User Experience through Agile Operations

ROADS presents new challenges and opportunities. Thanks to advances in mobile and broadband network technologies that are making the idea of ubiquitous connectivity a reality, Mobile Internet is booming.

Ken Wang, President of Global Marketing and Solutions Sales, Carrier Business Group, Huawei

Today Mobile Internet is changing the behavior of both consumers and business users and is incubating a generation of users that are sometimes referred to as “Generation C (connection)”. These millennials are “Digital Natives” born and raised in a digital world. Dealing with social media, the cloud, the IoT and Big Data analytics is a natural part of their lifestyles. This new generation of digital natives is the driving force demanding ROADS experience. And that fast-growing demand is forging a new digital business model.

With ROADS fast becoming the new benchmark for user experience in the digital era, businesses across all industries are reassessing their business models to meet user expectations. This change in user behavior is driving the creation of digital business ecosystems that will address the growing demand for:

- New formats of information exchange: voice centric -> data centric, a new value space
- New consumption patterns: offline -> online, a new business role
- New service modes predefined -> on demand, personalized
- New business models walled garden -> open ecosystem

Digital Transformation
The objective of digital transformation for telco operators is to achieve the ROADS user experience. When implemented, ROADS resolves a range of challenges for telcos: it improves customer experience and operational efficiency by eliminating siloed systems, fragmented data, and unresponsive operations. It also enables growth opportunities for new digital business systems, monetization of operator assets, establishment of open digital ecosystems, agile operations and accelerated TTM.

Telcos can align with these changes in customer
The new ground rules for such transformation include:

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<tr>
<th>Business Transformation</th>
<th>Operational Transformation</th>
<th>Architecture Transformation</th>
<th>Organizational Transformation</th>
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<tbody>
<tr>
<td>Everything-as-a-Service (EaaS), data &amp; digital services in collaboration with business and ecosystem partners</td>
<td>Data driven, user centric, automated business processes and operations spanning network to product, marketing and overall management/governance models</td>
<td>Real-time, intelligent and open enterprise architecture with cloud based infrastructure virtualization (Network, IT, Services: e.g. Cloud, M2M, Voice/Data) are the key enablers of EaaS</td>
<td>from a vertical, siloed management style to a horizontal, autonomous approach to managing the business</td>
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The traditional service model is no longer sustainable. Everything is pre-defined in this service model. But in the new digital world, everything must be on-demand and user centric. Customers increasingly demand a personalized, instant and digital service model instead of a predefined commodity model. Moreover, traditional CSP business models, that rely on certain killer services such as Voice, SMS and growth of the subscription base, are no longer sustainable.

Telco operators in the future will need to focus on:

- Participating in the full value chain of the digital economy to make everything as-a-service (EaaS), such as unrestricted monetization of core assets to consumers, enterprises and OTT/Partners, via flexible business models and through Digital Operations.
- It’s a no brainer to compete with other players in a niche market. Instead, telco operators should build and enable local digital ecosystems with all partners and monetize their core assets, which is the key to success in digital business.

Due to the ROADS’ user experience and flexible everything-as-a-service business model, digital operators need to change their operations focus from “Big” (performance, capacity, and cost) to “Fast” (service innovation, customer responsiveness, speedy TTM, and efficient trouble-shooting).

The keywords of digital operations are Fast and Intelligent:

- To provide the ROADS user experience, end-to-end operations must also be fast, with orchestration playing the core role to support rapid change, per-process / per-journey, and automated operations.
- Providing the flexible everything-as-a-service model to accommodate the fast growing pace of user demand, means that services must become more personalized, with big data playing a key role to support data-driven decision making and intelligent operations.

Digital Operations enable business agility in the form of:

- Large numbers of diverse types of products
- Agile business: Simplification, Automation
- Excellent Customer Experience
- Technology Evolution: cloud, elastic scaling,
Transforming towards Digital Business

multi-tenancy

Digital Operator Framework
The core of the Digital Operator framework is the Digital Operations platform, which enables agile business operations in conjunction with automated resource management in the context of user demand. Digital Operations transform the business model from predefined, industrialized products to flexible everything-as-a-service, and personalized services. This not only benefits the consumer, but also the enterprise, partners and operators. Huawei calls this the Telco OS.

• From the user’s perspective, the Telco OS is a “Digital Market Place”. End users can purchase products and services in the ROADS (Real-time, On-demand, All-online, DIY and Social) manner.
• From the partner’s perspective, Telco OS is a “Channel and Business Development Platform”. Content providers and software developers will conduct development, integration and sales through the Telco OS.
• From the operator’s perspective, Telco OS is the “Next Generation Operating System” for the Digital Operator. It will orchestrate operator and 3rd party assets (Network, IT infrastructure, Applications/Contents) as products, services and solutions for customers (Consumer, Enterprise, OTT/Partners) in a dynamic, personalized manner.

Core capabilities of the Digital Operations/Telco OS:
1. E2E Orchestration of the Service/Business Process/Resource: supports and enables lifecycle management, decision and workflow management of service, business processes and resources, across IT and CT domains e.g. data center/applications,

The new digital telco framework can be summarized as 3, 2, 1:

<table>
<thead>
<tr>
<th>Three Objectives</th>
<th>ROADS user experience</th>
<th>for all types of users, including consumers, enterprises, partners.</th>
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<tr>
<td>Open Digital Business</td>
<td>from communication service provider to digital business enabler.</td>
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<tr>
<td>Agile Operations</td>
<td>using IT technologies - from support systems to production systems.</td>
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<th>Two Platforms</th>
<th>Digital Operations Platform</th>
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<tr>
<td>Infrastructure Virtualization/Cloudification Platform</td>
<td>supports business enabling and agile operations, and provides backend capabilities such as BSS and OSS, Big Data.</td>
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<td>virtualizes infrastructure capabilities such as NFV, SDN and vDC.</td>
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<th>One Ecosystem</th>
<th>Open Digital Ecosystem</th>
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<td>collaboration with business partners to create a digital business ecosystem</td>
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network/connectivity, and terminals/users – instantly, according to business requirements, which are 1) Event-triggered; 2) Analytics-driven; 3) Business rules-centric; and 4) Template-based.

2. Big Data Analytics: Collect, aggregate and analyze full blown data, including business, network, and IT service data, to formulate a 360 Degree User Profile and to support agile, smart and automated digital operations.

3. Automated backend serviceable function modules: The BSS and OSS support functions will be transformed to backend serviceable automated modules, and will be orchestrated to support agile and automated digital operations.

**Digital Operator Organization Structure**
In order to fulfill and support the new business model, the overall organization structure is also required to be aligned with the new digital enterprise architecture and operations.

The basic principle is to break up vertical silos of MKT, IT and Network, streamline the e2e operations process, and enhance the business enablers to leverage business demand with infrastructure capabilities.

**Transformation Principles and Methodology**

**Transformation principle: Think big, Start small**

**Strategy-driven**
- Define ‘to be’ Digital Enterprise Architecture blueprint e.g. core capabilities of the Digital Operations platform – Orchestration
- Provide real-time user experience, manage massive simultaneous transactions

**Business-centric**
1. ‘Outside In’ / Scale Out - recursive development and continuous operations/DevOps, seamless migration.
   - Start with immediate business opportunities e.g.
     - Data monetization
     - Capability exposure
     - Experience optimization
     - Operational efficiency
2. Service innovation e.g. IoT, Cloud.
   - Discover best suitable technologies, recursive development, continuous operations; Focus on real time action.
3. Maximize the ROI - all deployed capabilities will be reused/migrated seamlessly over the integrated open platform

**Partner Together For Future Success**
Transformation to the digital operator is non-trivial. It is pivotal to collaborate with partners to win the future.

As the largest ICT solution provider in the Telco industry, Huawei likes to establish long-term strategic partnerships, work as the primary system integration partner, and provide best-of-breed solutions in collaboration with leading IT and CT companies. Huawei aims to share the risks with its partners and to build digital ecosystems, and in doing so, ensure future success.
BLOGPOST – Participation Is The New Innovation

We live in a time of great change. And technology is a big driver of that change. In fact, thanks to technology, the rate of change around us continues to accelerate – which creates significant challenges across the spectrum of IT, business, and society in general.

Jim Whitehurst, President and CEO, Red Hat

Keeping pace with change and overcoming those challenges will require fresh thinking and creative new solutions. But many of the hurdles we face, from slowing productivity and stagnant economic growth to underfunded schools and climate change, are simply too big for any one person or individual organization to address alone. We must find new ways to work together. And to do that, we need to be willing to toss out our conventional thinking about how work gets done. We need to embrace the notion that participation is the new innovation.

Let me explain.

We are now entering what attendees at this year’s World Economic Forum in Davos called the Fourth Industrial Revolution. While it was large industrial mills that kicked off the first Industrial Revolution in the 1700s, and smaller electrically powered machines that drove the second iteration, it was computers that brought us into the third industrial era with the introduction of the microchip in the 1970s. Today’s organizational structures grew out of the advances wrought from these different eras. Most organizations typically excel at driving efficiency in static environments, such as the workplace, a classroom, or even a hospital ward.

But it is the continued evolution of computers and information technology that has pushed us into an altogether new era, one that promises to change everything we thought we knew about how to get things done.

As Steve Jobs once said, the computer is like a bicycle for the mind because it enables you to multiply your capabilities and the speed at which you do them. We now have emerging computer technology we call artificial intelligence that promises to break even the bonds of the physical world – which can allow us to pedal even faster. Which begs a question – how can anyone keep up with that pace, let alone get ahead of it? How do you inspire people to innovate and dream up game-changing new ideas on par with creating the steam engine or the CPU?
The answer is by embracing the power of participation and open innovation. When you can bring groups of people together from across multiple organizations and disciplines, and allow them the freedom to work together, your ability to innovate becomes far greater. When I think about open source, it’s not about getting the best individual solution from thousands of people, it’s about getting a better solution from thousands of people working together. It’s about how we find synergy in innovation when we participate together.

Consider the analogy of an orchestra, which is made up of many individual musicians each of whom has their own unique skills and talents. The role of the conductor is to bring those individuals together in a way where the music they produce is something greater than any one of those musicians could produce on their own. But to create beautiful music, the greatest conductors recognize that getting the best creative output from their team is about giving up control. Rather than work top-down using a command-and-control model, the best conductors simply create the conditions where the musicians have the freedom to feed off each other. As the famed Israeli conductor Itay Talgam has said: “The worst damage I can do to my orchestra is to give them a clear instruction. That would prevent the ensemble, the listening to each other, that’s needed for the orchestra.”

That same lesson applies to how we work. You can’t just issue an order telling someone to “innovate.” Rather, as leaders, we need to create and catalyze the conditions where the seeds of innovation can germinate through participation.

And just like in an orchestra, you need a diversity of talent to excel. No matter how big your organization is, there will always be more smart people with different perspectives and experience outside its walls than within. And if you want to ensure that you maximize your potential to innovate, you will need to tap those resources even when they span different organizations or even geographies. By thinking beyond these borders, you can accomplish so much
more together.

At Red Hat, we see this power of participation every day in the world of open source, where user-driven innovation underlies the advances we are seeing in network evolution, cloud computing, Linux containers, mobile, and big data etc. **It is because of this participative movement, which sets the pace of innovation, that open source has become a default choice in IT.**

Evidence of this is HUAWEI’s recognition of Red Hat’s open source concept and influence, and their close collaboration with Red Hat in the open source area. Red Hat and HUAWEI have teamed up to cooperate in many HUAWEI Cloud Open Lab initiatives, examples of which include the extensive integration of HUAWEI’s SDN agile controller and Red Hat’s open source cloud platform and the integration of HUAWEI’s VNF MANO with Red Hat’s Cloud OS, to better support the smooth evolution of SDN networks.

But it’s not just technology firms that can reap the benefits of participation and open source. One of the reasons I wrote my book, *The Open Organization*, was to inspire others to think about embracing openness and participation in their organizations or communities. Participation and open source is helping to change the world by changing what’s possible. In government, open data and citizen participation are helping to increase transparency and introduce new services for available citizens. In healthcare, open access can help save lives or foster incredible advancements. In schools, open source is transforming education and how our students learn, and enabling greater access that will help shape the next-generation of innovators, leaders, and global citizens. Open source - in technology and beyond - is making the impossible possible.

**Imagine if the major sectors of our society began to function in interoperable ecosystems built on open source principles like transparency, sharing, and mass participation. What would our world look like in ten or twenty years if we unlocked that kind of potential for innovation?**

I believe it will be our ability to harness and stoke the creative capacity of the billions of people around the world that will determine the pace of human progress for the next century. That’s the real payoff from participation.
Enabling the Open Ecosystem to Transform Telecommunications

Telecommunications is in the midst of a dramatic transformation driven by the need for greater agility, increased capacity, and the ever-present quest to reduce costs. Driving the shift are a pair of complementary initiatives - Software Defined Networking (SDN) and Network Functions Virtualization (NFV), which are ushering in a new era of flexibility and openness that affect every aspect of the business.

Marc Cohn, Vice President of Network Strategy at the Linux Foundation, and Director of the OPEN-O open source project

The ultimate goal is an open ecosystem that vastly expands the value chain, offering participants large and small the opportunity to be rewarded for their innovations and value delivery. Success translates into adoption, inclusiveness and competitiveness, as SDN and NFV catalyze widespread change.

One important enabler of the open ecosystem are open source platforms that benefit both operators and vendors. Open source offers operators multi-vendor building blocks that overcome vendor lock-in; vendors benefit as well by leveraging non-differentiating software, freeing up scarce development resources so that they can focus on value-added innovations.

**SDN and NFV = Agility**

**Software Defined Networking** is a new network architecture model where logically centralized control provides unprecedented programmability, automation, and intelligence. SDN networks provide open interfaces and functional abstraction to readily integrate with network software and devices sourced from diverse suppliers, to achieve multi-vendor interoperability and choice.

**Network Functions Virtualization** is a deployment model whereby network functions - embedded in purpose-built hardware - are virtualized and deployed on general-purpose servers, storage, and networks.

By blending intelligent, virtualized SDN networks with NFV-based virtualized network functions, operators may significantly reduce the time to develop and launch new services, while simultaneously reducing costs. The resultant network agility unleashes an intelligent and automated infrastructure that may be optimized to support a wide range of use cases, paving the way to the carrier cloud.

**Open Ecosystems - Why, What, and How?**

As SDN and NFV evolve, there are no shortage of proclamations about how vendors’ proprietary solutions deliver agility, intelligence, and lower costs. Operators also seek to overcome long-standing vendor lock-in resulting from proprietary platforms that impede innovation and choice, constraining operator’s ability to differentiate their own services offerings. Operators need an open ecosystem.

In the absence of a formal definition, we propose a series of attributes that characterize an open ecosystem:
• Is first and foremost ‘Open’ - While the conventional wisdom is that ‘open’ is equivalent to multi-vendor interoperability, there are many proprietary solutions capable of managing multiple vendors’ hardware and software. A more appropriate definition for open, attributed to the Open Networking Foundation (ONF) is ‘not controlled by any single party’.

  • Addresses a common problem for a broad set of users

  • Incentivizes many parties to participate and work towards the common interest, while pursuing their individual goals

  • Acts as a living organism, where participants work collaboratively to influence the open ecosystem

  • Encompasses two dimensions:

  - Vertical - spans multiple technology domains, from the lower layers to higher layers

  - Horizontal - addresses multiple use cases and applications

  • Constantly evolves based on new technologies, new innovations, and business models

  • Provides opportunities for many to profit over the long-term; without sufficient profit, the Ecosystem will either wither away or suffer from a lack of investment.

Sustainable open ecosystems cannot be established by individual vendors or operators; nor can a standards body form one. Ecosystems gain momentum once sufficient numbers of operators and vendors commit. Until sufficient buy-in is achieved among the market leaders, more often than not one party will dominate, ultimately serving to undermine the Ecosystem.

Open Source and Open Ecosystems

Operators aspire to open platforms and vendor cross-collaboration that would otherwise be infeasible. Vendors are seeking to reduce development costs to create and maintain non-differentiated code (i.e., platforms) and to free up resources, so as to concentrate on increasing value.

One forum that has proven to be a fertile ground for open ecosystem cultivation is the open source community. Open source networking is among the fastest growing areas, with several major projects having been introduced as a result of SDN and NFV.

Successful open ecosystems and open source projects share common success criteria, including:

Both operators and vendors alike benefit from the open source model and the vibrant community that few projects attain, such as: OpenDaylight and ONOS SDN Controllers, Open vSwitch virtual switch, OpenStack (Cloud Operating System), and OPNFV (Open Reference Platform for NFV).

Open source, does not necessarily imply openness. Vendor-driven ‘Egosystem’, projects dominated by a single vendor or operator and plagued by barriers to participation, are unlikely to achieve critical mass. By engaging with a neutral party, such as the Linux Foundation, projects benefit from proven open source best practices, organization, infrastructure, and promotion.

Enhancing the open ecosystem

To illustrate how open source projects can enhance the emerging SDN/NFV Ecosystem, let’s examine OPEN-O, a Linux Foundation Collaborative Project formed in June, 2016. OPEN-O will be used by major telecommunications and cable operators to orchestrate agile, cloud-like service delivery over existing networking technologies and infrastructure, as well as SDN and NFV.

OPEN-O is also adapting the traditional open source methodology to be more suitable for large-scale platforms targeted towards major operators, and in the process enhancing the SDN and NFV open ecosystem.

Now that the project is underway, we have been refining a set of best practices that may enhance the open ecosystem lifecycle by addressing the success criteria introduced above:

1. Act Globally (truly) - From the outset, OPEN-O recognized that we must adapt our...
communications and day-to-day business practices in order to accommodate differences in time zone (15+ hours), culture, language, etc. We are particularly attentive to ensuring that we document key decisions, clarifications, etc. to avoid the misalignment that global projects are vulnerable to.

2. **Collaboration (internally)** - OPEN-O decisions are vetted by both developers as well as operators who are potential adopters. At the time of publication, 3 of our 8 Premier members are operators, including two of the largest in the world, China Mobile (> 800 M mobile subscribers) and China Telecom (> 200 M mobile subscribers), along with Huawei (the world’s largest networking vendor), as well as Intel, Ericsson, etc.

3. **Diversity (beyond gender, cultural, etc.)** - Diversity refers to the breadth of organizations participating in a particular project - the more the better. OPEN-O encourages new project proposals to include the participation of at least three companies. On the more traditional diversity front, 3 out of the 7 approved projects are led by women, including the largest OPEN-O project. Three women participate on the Governing Board as well.

4. **Collaboration (externally)** - As an open orchestration project, OPEN-O by nature must collaborate with complementary standards bodies, open source projects, and industry groups. Our platform must be aligned with the ETSI NFV, MEF LSO, and OPNFV Frameworks, and be integrated with several open source components and platforms, such as OpenDaylight, ONOS, OpenStack, and JuJu.

5. **Neutrality** - The OPEN-O organizers originally approached the Linux Foundation to act as an autonomous advisor to achieve the collaboration and community necessary for success.

**Closing Thoughts**

Major telecommunications, cable, and cloud operators - whose business is the network - are striving for an open ecosystem to fuel a radical and pervasive network transformation catalyzed by SDN and NFV.

Migration from the proprietary networks of today to the open era on the horizon will require unprecedented industry collaboration, inclusiveness and diversity, in a vendor-neutral environment. Open source communities offer an ideal forum to enhance the emerging SDN/NFV open ecosystem by accelerating technology adoption, while validating requirements and standards.

Linux Foundation Collaboration Projects such as OPEN-O are evolving the open source methodology to address the needs of major operators seeking large-scale open source networking platforms. The resultant best practices pave the way to widespread adoption as the industry is transformed to thrive in an era shaped by SDN, NFV, and the cloud.
Huawei Cloud Open Labs Enable Operators’ All Cloud Transformation

In parallel with the proliferation of new digital services we’re witnessing a corresponding increase in emerging new industries. Among them are a trillion-dollar market in enterprise IT cloud transformation, a video industry worth hundreds of billions of dollars, an IoT industry worth tens of billions, and a number of other emerging vertical markets that are under development. New business-to-consumer (B2C) services, such as video live streaming and the enormously popular mobile game Pokémon GO have already swept the world and are exploding at an astonishing speed.

Bruce Xun, Head of Consulting & IT Integration Services Department, Vice President of Global Technical Services, Huawei

In this volatile ICT era, how can operators seize new service opportunities to achieve constant business success? An effective way to do so is to deliver the ROADS experience, which means re-designing operations and infrastructure through digital technologies. However, business transformation is never that easy.

Traditional ‘silooed’ network architecture using dedicated hardware that is tightly-coupled with software, makes it difficult to fully realize end-to-end (E2E), real-time resource scheduling and service-oriented and automated operations, that rely on faster and smoother delivery of network services.

At the core of Huawei’s full cloudification strategy is the development of an ‘All Cloud’ ICT infrastructure which is focused on equipment, network, services and operations. The strategy aims to create systematic strengths in pooled hardware resources, fully distributed software architecture and full automation. The ‘All Cloud’ strategy is an effective way to support business transformation and infrastructure reconstruction.

Huawei Builds ‘Cloud Open Labs’ to Accelerate All Cloud Transformation

During the All Cloud transformation process, operators are faced with new challenges. These include converging ecosystems to support it, dealing with the uncertainty of new business incubation and innovation, simulating the smooth evolution from current to future networks, and automating the operation and maintenance of hybrid networks.

Huawei has inter-connected its four Open Labs and built a unified digital operations platform to support operators during their All Cloud transformations. These Cloud Open Labs allow operators, industry organizations and partners to jointly address the challenges of All Cloud transformations.

Huawei Cloud Open Labs comprises four labs in four different locations. The GNEEC Global Network Evolution and Experience Centers (in Beijing and
Shenzhen), the NFV Open Lab (in Xi'an), the SDN Open Lab (in Beijing), and the DC Open Lab (in Langfang). Through the use of these extensive lab facilities, operators can simulate an entire network and let them experience first-hand what it would take to evolve them into future networks, thereby helping to support the transformation of their operations.

Huawei Cloud Open Labs’ main functions are:

Ecosystem establishment
- Applications
- Platforms
- Infrastructure

Joint Innovation
- Technology innovation
- Operation mode innovation
- Service innovation

Pre Integration & Pre Verification
- For targeted architecture
- For Services
- For Projects

Huawei Builds an Environment for the Cloud Network
Most operators are building intra-region and cross-country networks. To ensure that these networks can deliver the ROADS experience, operators require a lab environment with a distributed structure, multi-vendor, multi-layer and cross-domain network for simulation and pre-verification purposes.

Huawei Cloud Open Labs provides such a lab environment. They have worked with over 40 partners; introduced an array of over 250 hardware products and over 400 versions of software products; covering services at the infrastructure, platform and application layers and a number of leading edge ICT technologies such as SDN, NFV, Cloud DCs and Infrastructure Enabling System (IES).

Huawei is the leader in integration and consolidation of multi-vendor devices, enabling interoperability among the four Open Labs through SDN technology. This realizes unified resource management, supported by the cloud management platform. Combined, they enable Huawei’s Cloud Open Labs to provide an integration environment with a distributed structure, multi-vendor, multi-layer and cross-domain network.

Huawei has developed an agile integration workflow and automated verification system bred from its decades of involvement in the telecommunications field. Its pre-integration and pre-verification capabilities will effectively ensure the smooth evolution from traditional to All Cloud networks. This fully reflects Huawei’s customer-centric business philosophy.

Huawei is currently cooperating with an operator from the Middle East to transform its closed telecom network to a next-generation convergent ICT infrastructure. By simulating the operator’s cross-country networks and testing new technologies and
network structures at the Huawei Cloud Open Labs, it has helped the operator change its traditional labour-intensive, error-prone and time-consuming service delivery methods and launched new services for consumers and enterprise users, with quick response times and low costs.

**Huawei Joins with Industry Partners to Establish an Open Ecosystem**

The open cloud network architecture has brought about a series of changes in standards, interfaces, vendors, business operation models and purchase practices. In the face of all these challenges, in order to speed up industry growth, Huawei Cloud Open Labs are dedicated to jointly establishing an open ecosystem with upstream and downstream partners to speed up industry growth.

Huawei Cloud Open Labs have cooperated with over 20 industry organizations and over 40 industry vendors to support the transformation and network evolution of operators' businesses and have attained the following results:

- In the SDN field, Huawei cooperates with industry partners such as Check Point, Fortinet, Marantis, Infoblox, Citrix, and F5, to provide value-added services via the enterprise CloudVPN solution.

- In the NFV field, Huawei cooperates with industry partners such as VMware, OpenStack, Red Hat, Wind River, and Ubuntu, to address challenges brought on by network decoupling. This facilitates operators' large-scale NFV deployments, and shortens time-to-market for new services.

- In the field of Cloud Data Center, Huawei cooperates with industry partners such as VMware, BMC, Accenture, Ovell, and Microsoft, to provide an E2E cloud hosting solution.

It is also worth noting that Open Platform for NFV (OPNFV) has designated Huawei's NFV Open Lab as one of the global standardized open-source labs. In addition, Huawei's Data Center Open Lab provides a lab environment for the OPEN-O community to collaborate on the development and testing of open-source projects.

**Innovation Helps Operators Become Agile and to Deliver the ROADS Experience**

In the era of ICT convergence, customer requirements change rapidly and new business opportunities are emerging. Operators need to be committed to creating technology innovations and innovative operating models and services that will meet customer requirements.

Huawei Cloud Open Labs provide α and β environments to meet operators’ and partners’ innovation needs. Through agile and iterative development and verification, Huawei helps operators achieve rapid service innovation. To be specific, in the α environment, Huawei provides micro services on its Platform-as-a-Service (PaaS) platform, builds service-based APIs, and establishes development and test environments to implement innovative solutions and services. After pre-integration tests, these innovative solutions and services are being rapidly deployed in the production-like β environment to achieve large-scale replication.

By leveraging Cloud Open Labs, Huawei is dedicated to working in collaboration with operators, industry organizations, partners, OTT players and developers on joint innovation initiatives. Their strategies, ideas, requirements, innovations and technologies result in the development of innovative solutions that are being rapidly launched commercially, having first undergone rigorous testing. This creates tremendous value for both customers and operators.

Also at the Cloud Open Labs, a Hong Kong telecom operator is cooperating with Huawei and Netflix, utilizing SDN and infrastructure enabling system (IES) technologies, to nurture an innovative intelligent video optimization solution that aims to intelligently provide customers with customized service assurance and optimal video experience, based on the access level of their account subscription.
The role of Carriers on the road to smart government transformations for countries around the world cannot be overlooked. In Singapore’s Smart Nation 2025 program, SingTel is helping the government build a truly interconnected country. Nearly 98% of all public services will be delivered online, providing citizens with the convenience of one-stop services. The program includes data collection, connectivity, and analysis covering the entire island city-state. Data collected from traffic cameras will be able to observe environmental cleanliness and predict traffic jams with high accuracy. Unmanned vehicles will be able to provide short-range transport services. These are just a few of the planned outcomes from the program.

In South Korea, SK Telecom Group is playing an important role as partner in the Smart Government program. The carrier is building an Internet of Things (IoT) platform based on an open architecture. The platform places particular emphasis on measurement, tracking, and monitoring elements. SK Telecom is joining with other organizations and enterprises engaged in education, culture, tourism, and health care fields to develop the innovative applications needed for each arm of the project.

China is a pioneer in Smart Government exploration. Although China has invested heavily, the sheer size of the government apparatus as well as imbalances in application at various levels of government, especially at the local level, ranked China only 70th in the 2014 United Nations e-Gov Development Survey of digital transformation. Realizing the need to accelerate and improve, in 2015 the Chinese government began to push development of cloud-based services to enhance data-share capabilities and strengthen network integration.
This has triggered a drive to build out cloud services capabilities nationwide.

**Government and Enterprise Cloud Markets – The Next 'Blue Ocean' for Carriers**

Building an ‘always-on’, smart government requires construction of a government cloud. Carriers can help governments make use of cloud computing, Big Data, artificial intelligence, and other technologies to build subject-specific databases and government information resource networks that are the basis of smart government programs. Compared with other cloud service providers, Carriers provide higher quality networks and offer superior infrastructure. Carriers also have the expertise needed to use existing government resources to provide customized services.

Recently, developments in the government cloud market have noticeably accelerated. The market has grown significantly in just the last two years. In 2015, the market for government cloud infrastructure platforms reached US $712 million, a 52.4% year-on-year increase. That market is expected to grow to US $3 billion by 2020 at a projected compound annual growth rate of 38%.

China has over 300 cities benefiting from national development policies and most will build cloud platforms for their e-Gov initiatives. The scale of this e-Gov development makes China’s government cloud market a veritable ‘Blue Ocean’ market for Carriers. The ability to deliver vetted solutions to host cloud services for governments will also open the door to providing such services for enterprises.

**Commercial Value of the Anyang e-Gov Cloud**

In the first quarter of 2015, Anyang City GDP growth slowed and government had to cut spending. This gave a sense of urgency to local government plans for a service-oriented model for government services. The city government aimed to implement cloud services to drive economic development. China Mobile(Henan Mobile) seized the opportunity to join with government to develop a framework that encompassed migrating services to the cloud, high volume data sharing, and a Smart City agenda.

The e-Gov Cloud Henan Mobile developed with the Anyang City government is the largest municipal hosting cloud in China. In addition to providing an engine to power the IoT, the unified cloud platform opens up cloud capabilities for government, citizens, and enterprises. As of Q1 2016, more than 70 government departments, enterprises, and public institutions had already migrated over 100 services to the cloud. Henan Mobile simultaneously scaled its cloud, private line, and value-added services to demonstrate a huge advance for digital transformation. The Anyang City government has not only been able to enhance efficiencies in its use of IT resources through purchase of cloud services, it has also managed to accelerate the speed at which it can place services online and optimize administration effectiveness. The level of public services and government image have improved as cloud services economic and social benefits become clear.

**The Sure-footed, Three-Step Build**

In the first stage of the Anyang project, Huawei helped Henan Mobile build a unified cloud platform inclusive of IaaS cloud, security, disaster recovery (DR), business cloud implementation, and other services in the form of a one-stop service package. In addition, Huawei helped the government move key services to the cloud for industry and commerce, social security and other areas, with certification of China’s Classified Information Security Protection Regulatory system. The platform delivers different levels of service reliability, from local high availability to remote DR and proactive assurance, while greatly reducing the cost of IT services. IT agility has been significantly enhanced as operations and maintenance (O&M) and management efficiencies have improved.

The second and third stages, namely data sharing and Smart City, are progressing smoothly. First, Huawei joined with Henan Mobile in helping the various organizations and departments under the Anyang Government share data. The outputs included a public information database inclusive of demographic, corporate, geographic, and macroeconomic libraries.

Second, Huawei and Henan Mobile created a centralized data sharing and exchange platform that allowed all service requests to be placed through a single portal. This was done to improve service levels and make access more convenient for citizens and businesses.

The third step involves building a Big Data analysis platform that can provide the infrastructure and support needed to advance the Smart City rollout and provide the basis for highly informed decision-making. Everything, from better planning of public transportation routes with analysis of population
The second factor is capacity-readiness. The government and enterprise cloud market is of vital importance to Carriers. If they miss this market opportunity, they may miss an entire line of complimentary offerings, including Internet data center (IDC) hosting services, private line leasing, and managed services. Competition in the market will shift from services and platforms to expand into infrastructure, networks, and across the entire industry chain. Success in cloud services and digital transformation will require Carriers to build their own “ecological chain” to expand cooperation in government clouds. These chains include proper matching of talent, resources, services, organizations, processes, and capabilities with cloud, Big Data, and IoT platforms at the core.

As demonstrated in the Henan Mobile – Anyang City e-Gov cloud project, Carriers clearly have unique advantages from their networking expertise and experience in developing cloud infrastructure and services. Carriers must learn to efficiently leverage these and turn them into measurable elements to successfully compete with Internet companies and other providers for the Blue Ocean government cloud market.

Elements of Success in Carrier Build-out of Government Clouds
Carriers need to consider two key factors to succeed in the face of fierce competition from Internet companies. The first factor is differentiated service. Carriers should build on their unique advantages in providing differentiated cloud services to governments, including:

- **Building local infrastructure to ensure a superior service experience.**
- **Local operations and maintenance teams are able to provide fast service response, and simplify use of services in the cloud environment.**
- **Developing ability to deliver customized security and DR solutions that leverage Carriers’ experience and credibility in business security and reliability compared to other providers.**
- **Developing cloud implementation capabilities to help enterprises migrate key services to the cloud with greater efficiency.**

Henan Mobile was able to make a successful transformation to digitized business from the traditional IDC hosting service in the Anyang Government Cloud project. Thanks to the richness of the cloud service catalogs, the Carrier has been able to improve revenue per rack by 800% over the previous model. Basic calculations show only a 2.5 year period is needed to recover investment in government clouds. Henan Mobile signed five to eight-year-long contracts with many of the government departments and industry customers in Anyang in just the first year alone, successfully expanding cloud services and managed services and producing a business model promoting service customization and integrated services.

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Outsourcing 2.0 – An Accelerant for CSP Digital Transformation

Michael Sullivan-Trainor, Executive Analyst, TBR

“W

e cannot survive the way we are going,” said Telefonica CTO Enrico Blanco. “Traffic grows 50% every year and 100% in some countries. Our network will be growing and we will be improving access and capabilities. But revenues are not growing - at this rate we have to lower our cost. We need to use additional business levers.”

Blanco’s sentiments are not unique. They reflect boardroom discussions worldwide. Telecom operators across the globe face challenges in cost control and revenue growth.

Cost control is a necessity for revenue growth in order to constantly keep pace with data capacity demand. For example: According to TBR’s review of global operator spending, based on company financial statements in 2015, average Opex grew from 77% to 82% of total operator spend in order to fund expanding network operations.

TBR benchmarks continue to track flat or declining revenue across traditional segments such as telecom and IT, while new segments such as cloud, software-defined data center and digital business grow at double-digit rates. New products, services, value chains and business models are required as evolution shakes the foundation of the ICT business.

The rationale for outsourcing: TBR research indicates that operators are shifting their budgets — as much and as quickly as possible — from buying, assembling and integrating technology components, to purchasing supplier offerings that deliver their desired outcomes.

Figure 1 Operators’ ITO Goals

Interviewed operators such as Millicom, MTN, Telefonica and others, pointed to cost savings as their highest priority. Other goals noted were improvement of operational efficiency (which drives cost savings) and enablement of revenue growth through the introduction of new services. Respondents also gave significant weight to evolving technology infrastructure through platform change-outs.

In terms of improving operational efficiency, streamlining and standardizing processes and lowering operating expenses were the highest-rated key metrics. As for enabling revenue growth, operators view increased business opportunities and increased numbers of partners as key metrics for success. Key to cost savings are “lower Opex costs and lower Capex costs”. In addition, operators are shifting more focus to two other factors. One is technology change-outs that accelerate new services innovation, and
the other is experience agility and fluid operations to speed up the development and deployment of new services.

Outsourcing 2.0 – The operators’ rationale for outsourcing is that they need to realize the value of business outcome-based investments whilst they evolve their infrastructures. This combination of business drivers is rapidly leading to a new wave of outsourcing initiatives where operators are seeking new relationships with suppliers. PwC calls this wave “second-generation outsourcing,” and one executive notes that it is turning over entire domains to vendors, including IT, mobile network operations and cable networks.

On the other hand, to undertake responsibility for business outcomes, service suppliers have to provide end-to-end solutions across networks, IT and other technologies. Figure 2 indicates key areas where operators choose to outsource to service suppliers.

Data center transformation (13%) and network transformation to SDN/NFV (15%) are the two most important areas cited by operators. They recognize the need to seek guidance from outsourcing service suppliers particularly in these two areas. For this reason, TBR expects vendors with strong positions in both CT and IT to benefit. Following is a rank of IT Transformation Capabilities evaluated globally by TBR.

ICT transformation capability, as shown in Figure 3, is unsurprisingly led by IT firms holding incumbent positions within operators’ IT environments. The most notable exception is Huawei, in 3rd position. Huawei was early to recognize the importance of CT and IT convergence and reacted quickly by adding IT services and products to its portfolio. Huawei’s transformation was duly noted by its customers, with one Chief Technology and Information officer surveyed calling Huawei one of the most “trusted partners to provide managed services for a converged IT and CT infrastructure.” The respondent said, “It has transformed its managed services to become a next-generation provider to offer managed solutions to overcome all the challenges related to ICT and convergence.”

Huawei’s comprehensive solution – which aims to evolve the operators’ infrastructure – converges and transforms both information technology and communications networks to ready them for new ICT services. Huawei delivers such transformations through its outsourcing solution.

Huawei Managed Services have signed 480+ contracts to date, managing 160+ networks in 90 countries. Managed Network & IT operations is based on common platforms that include a unified process framework, a software-defined operation platform, and Global Service Delivery Centers. Through its managed network services portfolio, Huawei is capable of supporting not only operational efficiency, but also improvement in customer experience and service quality. The convergence of IT and network operations also lays the groundwork for transformation of the operators’ organizations, processes, people skills and
Huawei’s Managed IT Transformation begins with strategic alignment of the operators’ business objectives, to deliver architectural blue prints, transformation roadmaps and business cases, with complete consideration for the convergence of the IT and network brought on by SDN/NFV. In the transformation design phase, according to the maturity of legacy technologies, it delivers waves design. In the transformation management phase, it continuously manages the transformation and synchronizes the adoption of multi-technology and multi-vendor integration to support cloud transformation.

Huawei’s Managed Enterprise Cloud is designed for changing IT service business models, where cloud computing brings new revenue opportunities. Huawei can help operators with cloud operations, platform integration and optimization, and migration of application to the cloud. Additionally, they provide joint-operation services, including building cloud ecosystems, acquiring new customers, new service innovation and go-to market plans.

Defining business values - Huawei began delivering these new values through its global outsourcing services. To date, they have built 830 data centers for operators worldwide and over 70 SDN/NFV projects are currently in development. Huawei is delivering unified managed services for three network and IT projects in the Middle East. In Africa, Huawei helped a leading operator to achieve infrastructure cloud transformation, and today they are helping that operator build a business-enabled systems platform (BES), which will enable new business opportunities in the form of digital, IoT and video services. Huawei’s end-to-end outsourcing solution has been adopted by European operators to accelerate the evolution of their infrastructure and operations. Huawei has also expanded its business in Latin America, where a number of operators have adopted or are considering moving to Huawei’s end-to-end solution to drive technology change-out and maintain leadership in their markets. All of these practices have showcased Huawei’s strength as a partner for telecommunication operators.
Top Talent: China Mobile's Key to Success in the Era of Big Connectivity

Leading global operators' transformation practices demonstrate that skills and expertise are quickly gaining high recognition as a main bottleneck for the impending digital transformation. China Mobile is set to become the foremost leading digital innovation company in the world and is in urgent need of additional talent. Consequently, they have formulated a comprehensive list of specifically targeted talent development approaches, and are keen to implement these practices.

As we enter the era of “big connectivity”, more and more users are subscribing to the Internet via billions of devices. Computer networks, sensors, actuators, and an extensive growing range of devices adopting Internet protocols, form a global interconnected system destined to dramatically change the way in which we perceive and interact with our environment and surroundings. Over the next five years, the Internet of Things (IoT) will transform social interactions and lifestyles from "connectivity between people and things" to an IoT ecosystem. "Connectivity" constitutes a critical foundation and fundamental element for the advancement and promotion of the digital era.

Global operators will assume an influential position in the dramatic shift required for digital transformation. As an internationally recognized leading operator, China Mobile provides high-quality service networks and possesses the largest global subscriber base ever recorded. Responding to the requirements of the transition, China Mobile proposes the “big connectivity” strategy and aims to achieve all strategy objectives by 2020. The strategy will enable China Mobile to attain a global leadership position as a digital innovation company, through additional large-scale connections, optimized services, and a robust and diverse series of available apps.

Digital transformation relies on talent cultivation. This article illustrates – in terms of cultivating industry professionals – the initiatives and approaches jointly contributed by Huawei and China Mobile to establish an elite team of unequivocal experts.

Understanding How Talent Development Enables Operators’ Digital Transformations

Any transformation is understandably a long and difficult process, and operators’ digital evolution is no exception. The vast majority of operators are currently engaged in the early stages of their digital transformations. Data traffic is increasing exponentially due to sudden upsurges in the development of the mobile Internet economy, and the rapid incorporation of big video and IoT apps. Global operators have come to recognize that network and operations restructuring, and service enablement, are the only ways to help expedite and ensure smooth digital transformations.

China Mobile proposes several requirements in the area of professional talent development, as follows:

- Network restructuring: The deployment of new technologies (such as SDN and NFV) requires communications technology (CT) maintenance engineers to develop the relevant IT skills, to allow for converged ICT maintenance.
- Operations restructuring: This will entail upgrading the service support system, establishing an enterprise-
level big data platform and optimizing operational agility. It will require the involvement of operations personnel to develop the necessary digital service innovation capabilities, such as end-to-end service operations and management.

- Service enabling: Marketing and services personnel, especially those who provide government and enterprise-focused services, will be required, in order to develop digital service integration capabilities. This is required so as to develop and offer all vertical industry groups, government and enterprise customers alike, with newly introduced network, cloud and IoT ecosystem services.

**Huawei and China Mobile Partnered to Advance Talent Growth**

Professional talent is an essential component for driving the momentum of digital transformation forward. Corporate organizations must establish an appropriate system to provide a fertile ground for talent cultivation and capability development. China Mobile tirelessly performs research in the field of professional talent development and collaborates with Huawei to cultivate future talent.

1. Creating the capability map and designing a talent skill model

Since 2010, China Mobile has been progressively developing a professional skills qualification system, which was launched to further research how to establish a talent competency and qualification (C&Q) system to help manage the learning and development needs of its professional staff. In 2014, in accordance with China Mobile Group’s strategy, business requirements and employee career development corporate program, China Mobile officially introduced the categorization of skill sets required for qualified network maintenance engineers. In doing so, it aims to build a team of talented personnel through skills testing, facilitated learning and assisted personal growth. China Mobile is leveraging the advantages of its expertise by applying Huawei’s methodologies and by instituting the talent capability system to further optimize the existing professional skill qualification system, to ensure smooth skill qualification.

This endeavor takes into consideration system design, organizational governance, resource upgrades, process standardization, tools & platforms, and outcomes implementation. China Mobile and Huawei, over the course of a year, were able to deliver a professional skills qualification system. This consisted of standardized professional career development & planning, separate libraries containing skills profiles, job-related FAQs and course materials, as well as methodologies for organization, process and platform management.

The new system defines qualification criteria for network maintenance engineers, based on corporate strategies and network evolution trends. The learning resource management systems suite – comprising a learning system, capability development system, exam system, and post-assessment management system – is optimized to motivate maintenance engineers to improve their technical skill sets. A unified standard exam system has been adopted to help identify capability and training requirements of maintenance engineers at varying levels. The automatic post-assessment management system is then used to verify the effectiveness of their learning programs. Capability criteria, learning system, exam system, and post-assessment management form an integrated system that lays a solid foundation for China Mobile to establish a professional team boasting numerous talents. The system provides guidance – in terms of skill qualifications – to other business lines, helps establish a career development path for employees, continuously stimulates talent development and incentives, and mobilizes the entire organization.

On October 21, 2015, the China Mobile Skill Preparation Improvement Project developed by Huawei and China Mobile won the 2015 Best Performance Improvement Award from the International Society of Performance Improvement in China (ISPI China) during the Fifth China Performance Improvement Forum (authoritative forum for learning and development in Asia).

2. Focusing on capability restructuring and key capability development during transformation

In 2012, China Mobile Group decided to launch
a comprehensive E2E skills enhancement initiative that would result in developing a team of professional, skilled and experienced maintenance engineers. They initiated the advanced network technology training project with the aim of cultivating a thousand network technical experts over a three year period. Huawei, with its extensive experience in talent cultivation, shared its vast knowledge and previous experiences with them, specifically in the areas of management systems, expert skills requirements, C&Q, and capability management. They also designed an "Elite Practice Camp" solution for China Mobile and taught their technical experts through a tried-and-tested "learning-by-doing" methodology. Professional capability assessment technologies were then applied to assess skill gaps, and the talent cultivation solution was designed based on the findings. This solution implementation entailed four steps: talent selection, centralized classroom training, on-the-job training, and project review. On-the-job training was based on the action learning theory. Using the "prepare, act, reflect, review (PARR)" theory, work orders were then dispatched and mentors were assigned to guide trainees through on-the-job training, considerably improving trainees’ aptitude and acumen.

Advanced network training currently encompasses key transformation areas such as IT, Security, IP and LTE operations and management (O&M). Trainees from different provinces then contributed to the building of technical expertise, across the entire organization.

In particular, China Mobile has established the Group network operations and maintenance expert system based on the skills qualification and training systems. Candidate engineers submit applications though an interview process, and they’re selected for skills enhancement training based on their technical capabilities and performance results. Upon successful completion of the training courses, they are re-deployed as key maintenance engineers and eventually become technical experts. Case and course libraries, and an emergency encyclopedia were also created for network operations, and maintenance knowledge accumulation and sharing, and China Mobile manages them as well, using its unified network knowledge management platform. Best practices and experiences were rapidly shared and applied, thereby optimizing expertise in the areas of project support and best practices across their operating territory.

The following five years will be a critical period for China Mobile’s digital transformation. The establishment of a digital ecosystem and rapid digital service innovations require engineers to master new skills. Therefore, China Mobile has been continually investing in strategic talent in the Internet IT field. Based on Huawei’s understanding of operators’ digital and talent capability transformations, China Mobile and Huawei have opted to continuously explore service deployment and cultivate experts, in order to satisfy talent requirements for network and service transformations.

The journey to complete digital transformation is both long and laborious. Organization and talent development are vital. Digital transformation will have to deal with complicated and dynamic service environments, as well as fast-paced technical development trends produced by volatility, uncertainty, complexity, and ambiguity (VUCA). China Mobile is researching talent capability requirements, and will reserve talent in advance in order to bring their "big connectivity" strategy to fruition. Huawei will collaborate with China Mobile to examine the capability transformation model for professional talents.
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