New metrics for a changing industry
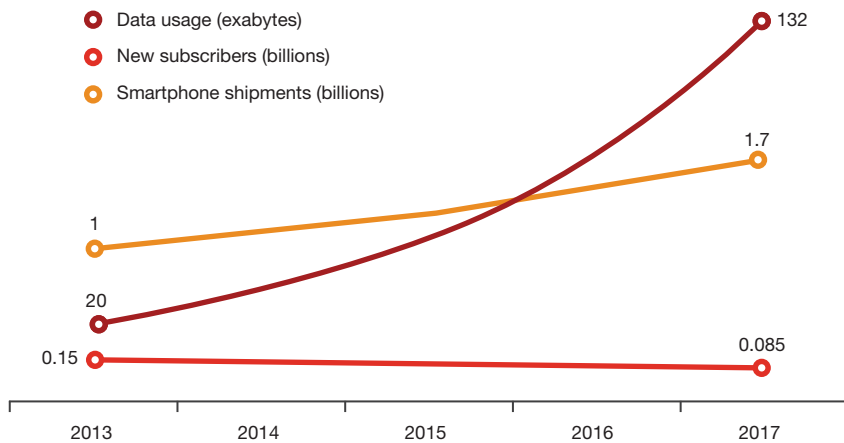
Haydar Aliyev Cultural Center, Azerbaijan

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Mobile operators are already laying the foundation for next-generation network architecture to push innovative services. The coming wave of mobile broadband will create unprecedented growth opportunities, touching new vertical applications and offering new experiences for consumers. As the industry transitions to the state of voice becoming increasingly irrelevant, operators will need to track success with the right metrics – the metrics that can shape their strategy for the long term.

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○ Data usage (exabytes)
○ New subscribers (billions)
○ Smartphone shipments (billions)

132

1.7

1

20

0.15

0.085

2013   2014   2015   2016   2017

Source: Cisco Virtual Networking Index 2013; IDC Worldwide Quarterly Mobile Phone Tracker, November 26, 2013.

The mobile industry is in the midst of a major paradigm shift. Customers are demanding voice services less and data services more, and the transition appears rapid. Smartphone sales are on the rise with global sales expected to increase from 1 billion in 2013 to 1.7 billion[1] in 2017 growing at 18.4% CAGR. It is projected that 15% of the smartphone sales in 2013 were due to new subscribers but by 2017 it will be less than 5%. The demand for the data network is growing as well; 20 exabyte of data transferred in 2013 is set to explode to 132 exabyte of data in 2017 at 66% CAGR[2]. Those trends (see Figure 1) suggest that the wireless industry – viewed purely from the perspective of the subscriber base – is stagnating but that the demand for smart devices and data network usage are rising significantly.

When mobile services were launched, voice was the primary service offered. Per-user metrics, such as average revenue per user (ARPU), churn rates, and net additions, have existed since the beginning. A per-user view of an operator's customer base was relevant when voice was the main service and when each customer owned a single mobile device. Mobile services have been evolving, and now customers own multiple types of smart devices (phones, tablets) and use a variety of services (see Figure 2). Without the full picture of how their customers use their devices and services, operators can't rely on per-user metrics as a measure of their success in meeting business goals.

As new industry trends emerge – such as enterprise mobility, machine-to-machine (M2M) communication, vertical applications, etc – operators must consider new business and operational metrics. They need to capture critical information about

Figure 2: The shifting of consumers' behaviour toward data
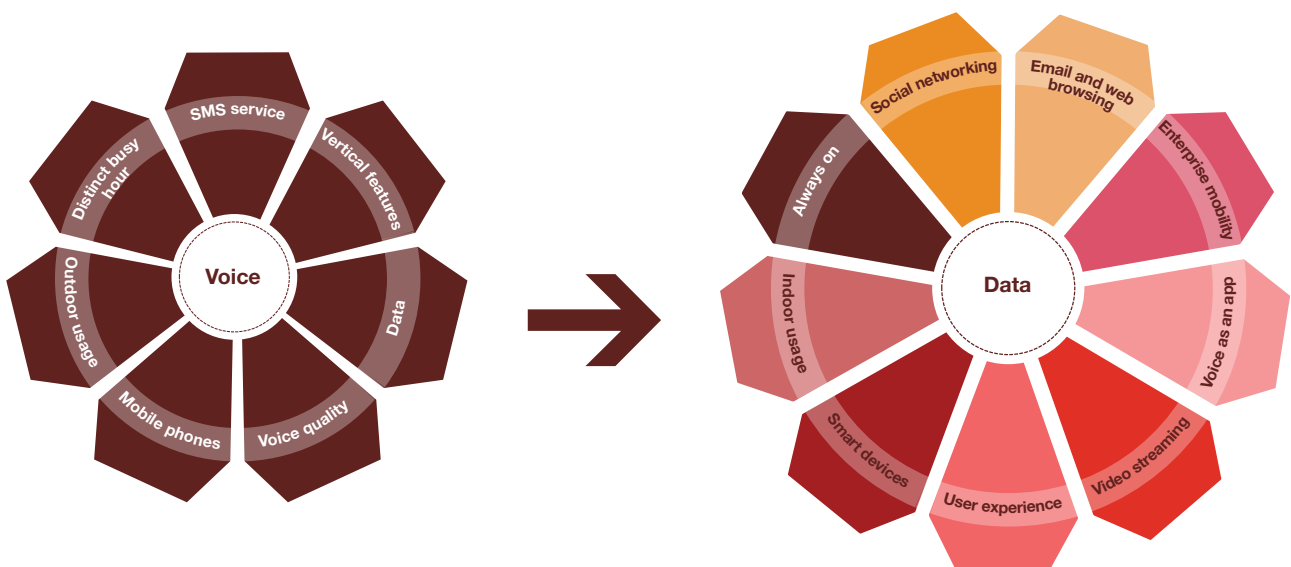
Voice centric to data centric mobile device users

— The utility of the mobile device has expanded from making phone calls to an experience where voice is merely an application.
— User experience and customer behaviour must be top of mind of mobile operators as we transition from voice to a data centric world.

Figure 3: Voice to data: the evolution of mobile broadband services

	Voice only	Voice & data	Data only (voice as an app)
Customer acquisition	Market share Net adds Churn rates Segments: prepaid/postpaid	Smartphone penetration % 3G vs. 4G %	User experience score (UES) Segments: enterprise vs. retail Number of devices owned
Service delivery	Network coverage Roaming coverage Voice quality Call drop rate	Data coverage % of voice Data roaming coverage Data throughput Latency	QoS per application Quality of coverage (speed, accessibility) Quality of experience
Business results	Voice ARPU Postpaid/prepaid subscriber number	Data ARPU Blended ARPU (data + voice) ARPA (per account)	Revenue per application Cost per bit
	Current metrics		**Future metrics**

what their customers value so they can decide strategically how to invest their capital. And operators must monitor the relevant business metrics if they want to keep up with their customers' changing demands.

In this article, we aim to introduce a new segmentation model and to explore usage-based metrics, which, when used together, can give operators valuable insights for positioning themselves as service innovators.

Making the case for new metrics

Advancements in mobile broadband technology let operators offer a range of wireless services on their networks. This has forced a shift in customers' behaviour as well, and more demand for data applications has resulted. But the metrics used to measure business profitability and service quality have remained unchanged. In Figure 3, we illustrate the evolution of wireless services as three phases: voice only, voice + data, and data only with voice as an application. To get a full perspective of the impact of metrics, we've considered three areas of an operator's business: customer acquisition, service delivery, and business results.

When voice was the primary service offered and each user had a single device, a per-user view was enough for operators to measure profitability and customer loyalty. The customer base was segmented primarily on the basis of subscribing to prepaid or to postpaid plans. When data networks were launched, operators focused on moving more of their customers to data plans and started measuring profitability based on data as opposed to voice ARPUs. But service quality still remained more at the network level than at the application level.

As the market for voice services becomes increasingly irrelevant, new metrics are needed to evaluate every aspect of an operator's business, from acquiring customers to everyday operations.

Customer acquisition

In a world focused on data, what consumers demand will vary based on the services offered and so will how they expect to experience the services. Adding a per-usage perspective to segment the customer base will help operators determine customer demand. Operators also will be able to provide high-quality service based on applications customers commonly use as well as to identify other services they

potentially can sell to customers.

Typically, operators have used their customer count and their service penetration by quarterly net additions to identify their market share. When they launch a new service, such as 3G/4G data, operators closely monitor its rate of adoption. But emerging trends – such as connected devices, M2M communication and enterprise mobility – are becoming an integral part of an operator's service portfolio.

Specifically, for enterprise mobility applications, according to Ovum, the penetration of wireless data among business users will reach 80% by 2015. Mobility has become an IT function and will dictate its own policies and rules. Operators around the world are developing platforms and fostering alliances with industry partners to build an ecosystem through which to introduce new services. And that will require a shift in operators' business models – from pure connectivity revenues towards transaction fees, vertical applications and even revenue sharing. So the metrics will need to evolve and will have to be different, for example, for enterprise and for retail customers based on their usage trends.

Service delivery

The quality of a mobile network has always been measured at the network level. Such metrics as voice quality, data throughput or dropped-call rate have been aggregated and reported for the entire network. That works fine when the number and types of services being offered are limited and the service quality customers want is comparable. But in the present world, customers are accessing multiple applications with varying quality-of-service demands. Before 4G networks, voice services and data services were delineated clearly. But with the introduction of voice over LTE (VoLTE), voice and data will be identical from a network point of view. Hence the need to measure quality of service by the application and by the type of service.

Business results

Operators typically have tracked their profitability by the metric ARPU, which is a monthly measure of revenues attributable to designated services on a per-user basis. They've used various flavours of ARPU – data vs. voice and postpaid vs. prepaid – based on the designated service and the customer segment.

But the emergence of prepaid and shared data plans has enforced a different business relationship between the user and the operator. Shared data plans include multiple devices, and that's made subscriber growth challenging to track. Each device may have its own data plan and pricing model. The preference of the individual data user remains hidden because the operator looks at the user as a single, discrete relationship. When the user no longer has the burden of a long-term relationship with the operator, the operator can't see the customer's usage patterns and mobility habits. The operator that focuses on data plans as a way to differentiate its services will find itself with diminishing returns.

When an operator has a one-dimensional view of its customers,

which is to make sure users are sticking to their allotted data 'buckets', selling them additional services as a way of increasing profitability gets more difficult. Data ARPUs, then, are becoming increasingly unreliable indicators of profitability. That's creating a need for a new way to capture the profitability of data services based on how the industry is positioned to evolve.

Because of the trend toward multiple devices per customer account, some operators are already beginning to measure revenues with a new metric, average revenue per account.

Transforming the measuring of success

In a market dominated by data and smart devices, operators must segment their customer base beyond the current categories of prepaid and postpaid. They need to understand their customers' usage patterns and user experience expectations for different applications and look beyond the network and user level for a reliable means of measuring success. Here we introduce a new approach to segmenting the current customer base and a few new metrics that can help operators measure the relevant success factors.

Customer acquisition

When a single user owns multiple devices and accesses multiple services, that customer's loyalty will need to be viewed across all of them. Operators may need to tailor their offerings based on each device type and make sure the user's experience is consistent among all the devices. Metrics such as content per device and M2M connections per user can give information about what type of content users are watching on their devices and whether there's an opportunity to sell them more services. If more devices of the customer's are connected through the operator's network, loyalty increases and the operator can manage the user's experience better.

Operators haven't distinguished their retail customers from their enterprise customers even though the quality of service expected varies widely between the two. The customer pool traditionally has been segmented based on price plans but not on the 'type' of customer. Given the trends of enterprise mobility and vertical applications, by segmenting the customer base as corporate or retail an operator can get a better understanding of the quality expected and can then plan network upgrades accordingly.

We suggest developing a segmentation model that characterises customers on usage-specific factors beyond the traditional postpaid and prepaid user segments. To define a user-experience score, factors to consider include the user's location, subscriber's age group, price sensitivity, and the applications used frequently. Network operators can then construct a well-planned strategy to optimise their networks and tighten capital spending, based on the regional user-experience score, while giving customers the best experience. The influence of each factor is shown below:

Location. Understanding what customers expect at the specific locations where they access data services is critical. That's because data has a visual aspect, as opposed to voice, where there's no need to see the device screen. Location can be divided into urban, suburban, and rural. And users behave differently when using data indoors compared to outdoors for each of the categories. The probability of accessing data services is greater in an indoor than an outdoor setting. The types of applications and the level of service quality expected vary vastly between locations. For example, a user on Wall Street expects different service from the network than does a user in a suburban area.

Age group. Subscribers can be segmented by generations into baby boomers, Gen Xers or Gen Yers and millennials. Analysing those age groups' patterns of use by region can

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give an operator good insights into the quality of service the network must deliver to address the demand of the most prominent age group in that region; price-plan specials to offer in the region; and where to aim to sell customers age-appropriate services.

Price sensitivity. Network operators must understand the spending power of their customer base. Subscribers can be classified as either budget, casual, or high spenders. Users' spending power and experience expectations are strongly correlated and can create loyalty. For example, if a network operator discovers that the majority of its subscribers in a specific

region are enterprise customers, then the operator knows it has to meet expectations of high-quality service and highly secure connections. If an operator finds that the majority of users in another region are buying budget plans, it may have less stringent performance and security requirements to meet.

Usage pattern. Customers access and use network capacity based on what interests them and what they need. Some users may make voice calls on the regular phone and use data minimally. Checking emails and browsing the Internet can be considered the behaviour of light,

casual users. Subscribers who indulge in social networking, accessing the network frequently, can be considered medium-capacity users. Those who stream videos and movies and use over-the-top applications can be considered heavy users.

Determining a user-experience score and aggregating it at a regional level will give wireless operators insights for tuning their networks to meet the demand in the region as well as identifying services to sell to the targeted customer base. We've highlighted some potential user-experience scores and their implications for operators in Figure 4.

Figure 4: User-experience scores and how operators can use them

Examples		1	2	3
Customer characteristics	**Location**	Rural	Suburban	Dense urban
	Age group	Baby boomers	Baby boomers, millenials	Gen X
	Price sensitivity	High	Medium to high	Low
	Usage pattern	Voice, general browsing	Social network, browsing, email, instant messaging	Enterprise applications, file sharing, secure transactions, email
User Experience Score		Low	Medium	High
Implications	**Network**	QoS not critical, room to reduce network spend	Ensure QoS per application meets the minimum threshold	Maximum QoS per application
	Operator budget	Low capex, Low opex	Medium capex, Low opex	High capex, High opex
	Trends	Legacy user, cost per bit could be high due to low data traffic	Upsell vertical services and applications	Use WiFi, small cells, upsell network resources boost

As markets mature globally, we see strategies based on price and value continuing to be less effective and quality of service emerging as a differentiating factor for operators.

Service delivery

As markets mature globally, we see strategies based on price and value continuing to be less effective and quality of service emerging as a differentiating factor for operators. Historically, operators have measured the health of their network at an aggregate level, publishing such key performance indicators as their dropped-call rate or packet-loss rate at the network level. They've spent a lot of effort making sure all the network elements and the interfaces perform well, which has meant measuring hundreds of performance indicators at various points of the network architecture. But that effort hasn't always translated to improving users' perceptions of the network since many indicators of the network's performance don't have the same impact on a type of service.

Such performance monitoring worked well when voice was the primary service offered and the number of data applications was limited. But in the current world of data, operators need to establish an intelligent link between performance indicators from network elements to performance at the application level. The approach can involve measuring three levels of key performance indicators:

1. **Network-performance indicators** will give a solid understanding of the network's health from a technology point of view, such as service availability, available bandwidth, and reliability.

2. **Quality-of-application indicators** will give an understanding of health at the application level, such as the rate of success for users accessing the Internet, streaming throughput (bit/sec), and P2P bit rate.

3. **Quality of overall experience** will measure the total end-user perception of the network by linking the network's performance with application-level quality. An operator can make strategic decisions for its business by identifying services popular with its customers and what content they're consuming, the total cost of delivering such services, and the revenue posted.

Understanding which indicators of network performance directly influence the quality of applications and the overall experience for customers is crucial. Otherwise, operators spend unnecessary time and effort on troubleshooting problems and have minimal impact on the quality of service they give customers.

The deployment of LTE will offer operators greater control of service quality. The standards body 3rd Generation Partnership Project (3GPP) has developed a comprehensive suite of functions – quality of service, charging, and policy management – to help operators differentiate themselves through service. The functions will let operators define pre-set rules for allocating resources based on individual applications such as email, browsing, voice, video, P2P, gaming, and streaming. The quality of service users expect varies by service type, so operators need the right strategies to positively affect how users perceive quality. It's essential to understand those indicators and dimension the network accordingly.

Business results

Heavy price competition, growth of the prepaid segment, and varied customer consumption patterns are placing intense pressure on an operator's profitability. With ARPU becoming increasingly irrelevant, operators can track cost per bit and revenue per application to measure the profitability of their offerings. Cost per bit can help in comparing costs across various technologies or the operation itself and in understanding the implications of spending on base stations, backhaul, and access technologies.

With the continuing adoption of LTE technology and the availability of a wide range of applications, the underlying bit carrying the information gains a lot of significance for the operator. A bit used for browsing on the Internet shouldn't be treated the same as that for streaming music. Both the required quality of service and, more important, the users' perceptions of what they experience differ vastly for those two applications. The cost of delivering the services varies too, as operators are trying to identify the most cost-effective solution for coping with high data usage.

The typical costs for mobile broadband are the network operating expenditures (opex) and capital expenditures (capex). Non-network costs will be related to terminal subsidies, marketing, customer acquisition, care, and other IT services. When calculating cost per bit, an operator may or may not consider the cost of acquiring and building the site, depending on when the cell site was launched. Radio equipment, transport, and the core network make up the rest of the capex costs of a cell site but – relatively – they're not that high. The opex component of a cell site includes site rental, network software and hardware maintenance, power consumption, and backhaul leasing. Because mobile networks have a higher opex than capex, lowering the network opex is essential.

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Cost-per-bit calculations may vary for a variety of reasons, but primarily because of traffic distribution and geographical location. An urban site with heavy traffic and overlapping coverage will have a lower cost per bit compared to a rural site that has to cover a larger area. As subscriber count and traffic increase, cost per bit goes down since the overall costs are shared by more subscribers. Costs can be high when a new technology, such as LTE, is launched and network use is low, or when capacity is expanded, through either spectrum or radio additions to a highly loaded cell site.

Having high spectral efficiency compared to HSPA networks, LTE can play a pivotal role in reducing the cost per bit of delivering data services. A flat architecture with fewer interfaces and an all-IP backhaul reduce the cost of network maintenance. Given the dependency on traffic and location, calculating the cost of delivering services at every cell site may be challenging. Still, this metric can help operators explore various options for upgrading the network and improving its capacity.

Once operators narrow down the cost per bit per application, they can focus on how to deliver services based on customers' profiles and tolerance for service quality. Ultimately, they'll need to make sure they get the most revenue per application or per use while they keep costs low. This can increase profitability – at the same time, giving customers the most relevant services – and gain for the company a measure of success in introducing new, innovative technology.

Taking action: redesigning the business model

Mobile operators around the world are investing heavily in their networks to bring the latest technologies to their customers. They're viewing their networks as a platform that can support a multitude of applications and can foster innovation. The items highlighted in this paper are not easy to substantiate and will require operators to redesign their existing operating model. We suggest approaching the task in three phases:

1. **Assess the current metrics and identify future needs.** In a competitive wireless marketplace, operators can survive only by giving customers their best value proposition. That means innovating. But for innovation to empower customers, operators need to have the right information to make informed decisions. As they venture into adjacent industries and start providing applications for M2M and enterprise mobility, operators need to know whether their existing indicators of success and profitability apply and are relevant to such new services. When creating their long-term vision, they need to remember the importance of identifying the metrics that can help them reach their strategic goals.

2. **Develop a road map for data and reporting.** Operators are already sitting on a wealth of customer data they can mine to get insights into users' behaviour. A big step in moving towards new metrics would be to deploy the right set of support systems and track the

relevant performance indicators. Drawing on large volumes of data, big-data-analytics solutions can help operators achieve immediate results by inferring, discovering, and predicting key performance indicators, actions, and recommendations. Operators will need to gather data from various sources – such as location call data records, performance statistics, CRM systems, and usage – into a single platform, making minimal changes to existing systems.

3. **Design governance and an operating model to act on new metrics**. Finally, to make these metrics operational means redesigning the current operating models because they're based on reactive, one-size-fits-all concepts. Consider the Customer Care organisation. They need to act as trusted advisors to customers, which means using the metrics highlighted here to track a customer's unique needs and offering multiple options for solving problems before they become issues. For Engineering and Field operations, tracking the quality of service at the application level and linking it to how the network is performing can make sure network issues that directly affect what customers experience are addressed. From a marketing and business development perspective, knowing the usage patterns of customers can help identify the most sought-after services and can present a lot of opportunities to sell additional services. In developing the corporate strategy, management

can ensure profitability by providing the highest-quality service at the right cost to the right segment – and then can make strategic decisions about network spending. Making these metrics readily available to relevant stakeholders will be important in realising the benefits.

The coming wave of mobile broadband will create unprecedented opportunities for operators to grow through new vertical applications and the new experiences available to consumers. Already, operators are working on their next-generation network architecture as a means of pushing innovative services, but they need new metrics as well. To track their success, they need ways to measure customers' usage patterns and expected levels of service quality – measures that can shape the long-term strategy for differentiating a company.

Footnotes

1   IDC Worldwide Quarterly Mobile Phone Tracker, November 26, 2013.

2   Cisco Virtual Networking Index 2013.

Srinivas Ranganna   **Pranav Parekh**

About the authors

Srinivas Ranganna and Pranav Parekh are senior associates and Dan Hays is a principal in PwC US's Communications practice. For more information, contact Srinivas by phone at [1] 214 754 4879 or by email at srinivas.ranganna@us.pwc.com; or contact Pranav by phone at [1] 214 754 4827 or by email at pranav.parekh@us.pwc.com; or contact Dan by phone at [1] 202 756 1733 or by email at dan.hays@us.pwc.com.

Dan Hays

www.pwc.com/communicationsreview

To have a deeper conversation about how this subject may affect your business, please contact:

Dan Hays
Principal
[1] 202 756 1733
dan.hays@us.pwc.com

Pranav Parekh
Senior Associate
Tel: [1] 214 754 4827
pranav.parekh@us.pwc.com

Srinivas Ranganna
Senior Associate
Tel: [1] 214 754 4879
srinivas.ranganna@us.pwc.com