# *Communications Review*

## Going further

pwc

*A journal for telecom, cable, satellite and Internet executives*
*Volume 17, No. 3*



*Periodic assessments of our progress, innovations and goals help fine-tune – or radically alter – the path ahead. With the accelerating pace of change in telecoms, no operator should be content with business as usual if they want to be successful in the future.*

Cover image: Expo 2012 in Yeosu, South Korea.

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PwC's Communications Industry practice delivers a complete range of professional services to telecom, cable, satellite and Internet service providers across the globe. The group provides industry-focused assurance, tax and advisory services to build public trust and enhance value for its clients and their stakeholders.

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# *Message from the editor*

With this latest edition of *Communications Review*, we start 2013. The new year always inspires us to take stock of how far we've come during the previous 12 months, and to think about how we can go further to press home the advantages and innovations we've achieved. Given the momentum of change that we saw in the industry during 2012, the opportunity and need for this type of review at the beginning of 2013 is arguably greater than ever.

What might 'pressing home the advantages' involve? The answer can vary widely in different markets and different areas of the business. Sometimes it means doing the basics better. For example, there comes a time when something or someone matures – a market, a business, a product, even a person – and continuing to grow requires fine-tuning. Other times, more radical change is needed, perhaps taking the business in a completely new direction. But at the dawn of 2013, what's clear is that the continually evolving environment of our industry demands that we constantly challenge, renew and improve our ideas and approaches.

The need for continual improvement links all the articles in this edition. In the first piece, "Small cells, big opportunity," authors Dan Hays, Shailabh Atal and Ayesha Datta examine the rapidly growing trend of using small cells. By enhancing the capacity and coverage of mobile networks and using existing spectrum more effectively, small cells can help operators meet the rising demand for data services and speed. Experience shows that by moving to small cells, an operator can differentiate itself in such vital ways as lower costs and better service quality. But although the opportunities small cells present are significant, so are the challenges – including the need to establish the right business models, leasing agreements and marketing messages.

In our second article, "The scale of the capex challenge," we elevate the focus from small cells to the single biggest issue facing the industry worldwide: the need for massive capital investment in network capacity and upgrades. As authors Gary Taylor and Trigvie Robbins-Jones point out, in the past 30 years the industry's annual capital expenditures globally have soared from around US$50bn to US$325bn in real terms. But our research shows that the returns this rising investment generates lag behind the cost of capital.

Put simply, something has to change. What's needed is a smarter, more structured approach to capex based on a new capital operating model. Our authors call for a model that tracks and measures capex more closely, identifies opportunities to release resources for other projects and uses incentives and clearer accountability to encourage smarter behaviour.

Our third article moves from capex to revenues and, specifically, to the intensifying battle to monetise digital media in emerging markets. In "Navigating the digital media ecosystem in emerging markets," authors Henri Tran and Brian Potterill discuss how mobile operators have largely missed out on the digital gold rush in developed markets and device manufacturers and software players have moved in swiftly to capture most of the revenues. As smartphone use increases in emerging markets, mobile operators need to learn the lessons from developed markets to prevent history from repeating itself.

To win their fair share of digital revenues this time around, mobile operators need to be sure they have the right business model for each market. They need to offer advertisers effective mobile delivery platforms supported by deep, high-quality consumer information and analytics, and to have sufficient scale to reach the right numbers and types of consumers in the right way. The piece ends with a word of caution: if mobile operators in emerging markets fail to act now, they risk losing out to non-operator competitors in the same way their European and US counterparts did.

In our fourth article, "Revenue assurance: where to from here?" Andrew Wheadon and Jesús Domínguez Colino shift the focus from battling for digital revenues to needing to capture those revenues accurately once they've been won. Operators' products and services are becoming ever more complex and more often involve third parties, such as content owners. That makes a rock-solid grip on all revenues and billing vital, both for supporting the revenue streams themselves and for keeping customers satisfied. The top factors that make customers dissatisfied include incorrect bills, delays in launching competitive new services and failing to deliver those services successfully – all of which can spring directly from shortcomings in revenue assurance.

Because it's growing more important, the authors say, the revenue assurance function must decide on its role. Revenue assurance either can stick with its traditional role or evolve into a broader role focused on helping the operator reduce costs and define better business rules for access, products and network effectiveness.

Finally, for our Perspectives section we book our usual face time with a leading mover and shaker in the industry. Successful companies never rest on their laurels but continually look for ways to improve. A great example of this mind-set is the US operator Verizon – a business that has not just survived but has thrived through many decades of sweeping change encompassing regulation, innovation, consolidation, competition and technology. To find out some secrets of Verizon's success and how it plans to keep building on its achievements, we speak to Verizon's Chief Financial Officer Fran Shammo, who plays a pivotal role in taking the company's evolution further.

As we enter 2013, it remains only for me to wish you all a happy and prosperous new year. I hope the thinking and insights in these articles will help you achieve both goals. As ever, I'm eager to hear your views and feedback to help us keep *Communications Review's* finger firmly on the pulse of the industry. So please feel free to send any comments to me by email at pierre-alain.sur@us.pwc.com, or to call me directly on [1] 646 471 6973.

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# *Small cells, big opportunity*

*The use of mobile data is surging – as is the demand for ubiquitous coverage – so wireless networks need to make the most of existing spectrum. Augmenting the capacity and coverage of mobile networks with small cells is rapidly becoming accepted as a high-priority solution throughout the industry. Products are becoming more standardised, with more equipment vendors and network operators introducing small cells.*

*The shift of small cells from the margins to the mainstream of modern mobile network management is happening rapidly. Those who lead the way in small cells can look forward to accelerated operating cost advantages and superior service delivery. But equipment vendors and network operators are still searching for the right business models that can make sure this transformation is profitable, operationally manageable and serves customers well.*

**by Dan Hays, Shailabh Atal and Ayesha Datta**

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Calatrava Arches, Olympic Village, Athens, Greece.

The exponentially increasing demand for data services on mobile networks around the world has forced mobile network operators to revisit their infrastructure and examine its ability to keep pace with what customers need. With finite spectrum assets and costs to acquire and build out capacity often approaching billions of dollars, operators are looking for innovative, flexible, reliable and cost-effective ways to alleviate their capacity and coverage issues.

Augmenting the capacity and coverage of mobile networks with small cells is rapidly becoming accepted as a high-priority solution throughout the industry. Some of the largest wireless network operators have significant implementations underway, even though early starts were hindered by interference issues, technical challenges and commercial roadblocks. A new generation of small cells now offers a new opportunity. Mobile network operators can substantially improve capacity and performance at a fraction of the cost of building out their macro cellular network while working seamlessly across suppliers and network technologies.

The mobile industry's understanding of the business case for small cells is growing rapidly. Products are becoming more standardised, with more equipment vendors and network operators introducing small cells. The shift of small cells from the margins to the mainstream of modern mobile network management is happening rapidly.

In the United States, at least two national wireless network operators have disclosed hundreds of thousands of small cells to already be operating within their networks. In fact, 72% of mobile network operators surveyed by Infonetics in 2011 said they had adopted small cell solutions.[1] That figure suggests carriers are increasingly experimenting with deployment and product scenarios well beyond the home-based femtocells that heralded the era of small cells. Enterprise femtocells and outdoor metropolitan picocells, for example, are entirely new categories of small cells, indicating the potential breadth of commercial applications for these solutions.

As the need for and the adoption of small cells has grown, a majority of the technical challenges early adopters faced have been addressed. But equipment vendors and network operators are still searching for the right business models that can make sure this transformation is profitable, operationally manageable and serves customers well.

Here, we look at various ways equipment vendors and network operators can overcome the challenges. For example, typical macro site-oriented network deployment processes that have focused on search rings, tall towers and backhaul need to give way to approaches that enable rapid and cost-effective deployment of aesthetically-pleasing small cells in office parks, shopping malls and downtown districts. Similarly, widely-used managed services delivered by

## *What are small cells?*

Small cells fundamentally alter the mobile network approach. In a typical macro cell site, covering as much as several square kilometers, only a fraction of the energy that a macro cell broadcasts is used toward actual mobile connectivity. As data traffic rises and requires more bandwidth, this blanket approach becomes more and more energy intensive.

Small cells, however, are low-powered radio access points that operate in licensed spectrum and connect mobile devices to mobile networks over a small area. They can significantly improve coverage inside homes, in small and large offices, as well as in densely populated outdoor public spaces. Localised and targeted, this approach delivers strong connectivity more efficiently than the traditional approach of using only macro cells. For operators it enhances coverage, reduces space requirements and lowers energy bills, while for customers it improves signal strength and extends the battery life of mobile devices.

By offloading traffic from the macro cellular network during peak congestion periods, small cells also help mobile network operators make sure customers have strong signals and, thus, better voice quality, fewer dropped calls and faster data download and upload speeds. The result? A relatively simple, low-cost alternative or supplement to the traditional macro cellular network.

'Small cell' is the catch-all phrase for the technological concept of extending mobile network coverage by using a cellular base station of smaller size and lower power output than macro cell, and by using existing spectrum capacity more efficiently. Types of small cells – femtocells, picocells, and microcells – differ in their coverage:

- **Femtocell.** A small cellular base station, roughly the size of a home Wi-Fi router, that's typically used to enhance mobile coverage in a home or small business. (See Figure 1.)
- **Picocell.** A small, network radio element used to improve coverage in large buildings or to improve network performance in dense metropolitan areas.
- **Microcell.** A cell in a mobile phone network that's served by a low-powered cellular base station. It offers coverage to a limited area, such as a shopping mall, hotel, or airport.
- **Distributed Antenna System.** A collection of low-powered cellular antennas spread across a large area. Although not usually considered a type of small cell, its benefits are like those of small cells. It delivers additional capacity and better coverage – using a smaller amount of macro cell equipment – in dense urban locations such as business districts and subways where locating a traditional tower or rooftop site may be difficult or impossible.

**Figure 1: Concept of small cells: The femtocell at home**

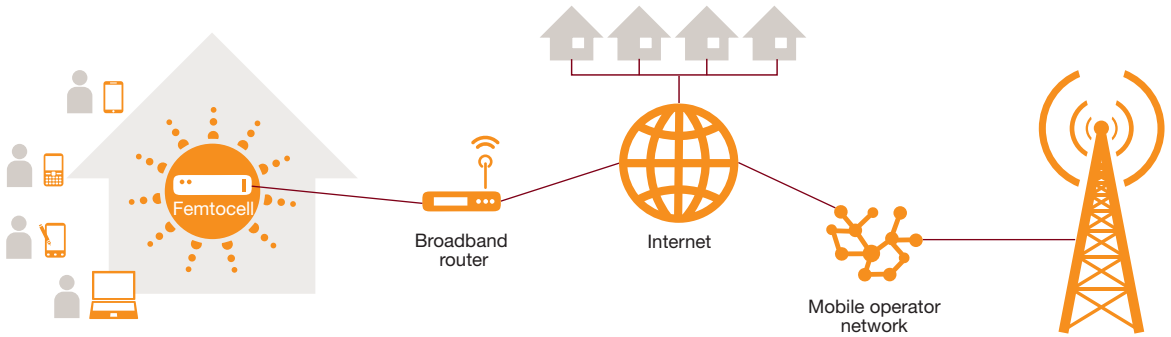
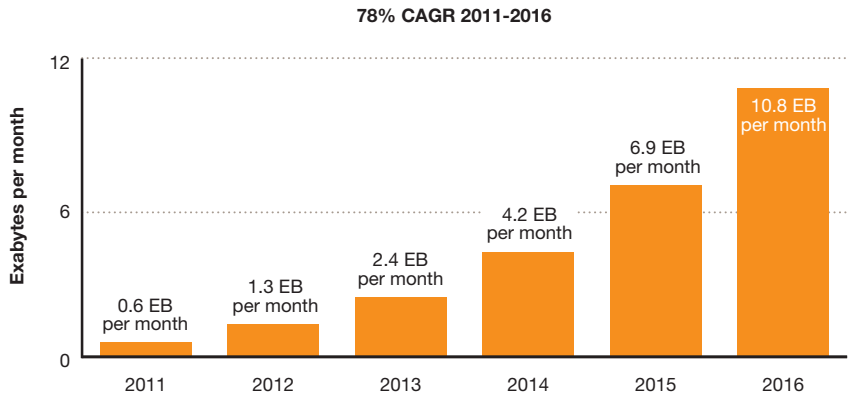


**Figure 2: Growing data demand on mobile networks**




Source: Cisco VNI Mobile, 2012.

equipment vendors may need to give way to small cell infrastructure which is both owned and managed by vendors and even shared by multiple operators. Virgin Media, for example, has led the way for this in the United Kingdom by focusing on wholesale small cell and Wi-Fi networks.[2]

Such transformation requires operators and vendors not only to redesign their business processes and supporting systems and tools, but also to rethink their business models.

## Why address the demand on networks now?

With the widespread proliferation of smartphones[3] and connected tablet devices, the US Federal Communications Commission forecasts that the demand for mobile connectivity will begin outstripping existing network capacity as early as the end of 2013. This could lead to reduced service quality, higher costs for customers and greater churn rates for mobile network operators. Meanwhile, the acquisition of new spectrum is extremely costly and very difficult to even find in the near term.

A spectrum 'crunch' is believed to exist in many countries around the world, with regulators experiencing difficulty in freeing up new spectrum to make available for surging mobile usage. In countries ranging from Brazil to India, spectrum auctions have faced lengthy delays and fierce bidding for the most attractive bands.

Mobile data traffic globally is expected to grow 13-fold between 2012 to 2017 at a compound annual growth of 66% (see Figure 2).[4] Fueling that growth is the rapid expansion of high-speed 3G networks, as well as the introduction of 4G networks that promise mobile connectivity speeds on a par with today's wired broadband services.

On top of consumers' appetite for the mobile Internet come all the new applications and services in areas ranging from mobile health to connected smart energy grids and other machine-to-machine mobile applications. Machine-to-machine data traffic is projected to grow 24-fold from 2012 to 2017, a compound annual growth rate of 89%.[5] All these data advances, combined with the intuitive mobile devices like smartphones and tablets, are creating a level of demand that will quickly outstrip current network capacity without immediate technology interventions.

Surging demand has networks in mature markets such as the US operating at 80% of their maximum capacity, compared to the global average of 65%.[6] And heavily trafficked areas already are operating at levels of demand that exceed capacity, leaving no room to maintain and repair heavily burdened networks. The lengthy cycles to construct new cell sites, upgrade systems and deploy new spectrum also challenge mobile network operators – so they're looking for new ways to keep up.

When small cells arrived in the US marketplace in 2007, they were marginalised and viewed largely as a stopgap solution for specific cases when a company's mobile coverage came up short. Now, as their value becomes more apparent and more compelling, small cells are becoming an integral element of next-generation mobile infrastructure. For example, T-Mobile USA's Chief Technology Officer Neville Ray recently spoke about the importance of the more than 6,000 Distributed Antenna

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Systems that the company will deploy following its planned merger with MetroPCS.[7] Similarly, Virgin Media in the UK has stated that it sees more value in building a wholesale network of small cells and Wi-Fi hotspots than constructing a new 4G LTE network.

As technology and business solutions emerge, many mobile network operators are using small cells to cost-effectively enhance their networks as well as capture additional revenue. In fact, a recent survey by Informa Telecoms and Media found that 60% of operators believe that small cells are now more important than macro cells in their LTE deployments.[8] And recent research from the Small Cell Forum, completed in conjunction with Informa, confirms that the 6m small cells deployed worldwide had outnumbered macro cells by the end of November 2012, and were on track to grow to 62m in 2016.[9]

Projections of growth in small cells vary significantly. That's because of the wide variety of business cases being developed around different set of use cases and differing definitions of small cells. Some say small cells complement macro cellular networks; others consider them a wholesale replacement in small, densely populated areas. Similarly, some, but not all, analysts consider Distributed Antenna Systems to be a type of small cell. Although analysts vary on the overall market opportunity, a closer look at the flexibility and intelligence of the current solutions reveals a market with the potential to be transformed.

## So many benefits: bolstering connectivity and beyond

The mobile industry is experimenting with various solutions to bolster mobile connectivity, including revising its network design and deployment approach. Besides offloading significant traffic to Wi-Fi networks by means of free hotspots and indoor Wi-Fi solutions, operators' efforts include using more spectrally efficient technologies – including small cells. Densifying macro cell-based networks with small cells can help bridge the divide between network demand and capacity, and can help providers lower costs and retain more customers.

The benefits of deploying small cells as part of an integrated network management strategy include:

### *Maximising spectrum return on investment*

The scarcity of additional spectrum assets dictates their high cost. The cost of prime swaths of spectrum can run into the billions of dollars. That's been evident in the recent spectrum transaction between Verizon Wireless and SpectrumCo, as well as the deal AT&T entered into with NextWave. Small cells can help support growing traffic volumes and related revenues for premium data services by using existing spectrum assets more efficiently.

### *Reducing capex and opex*

Analysts' and vendors' estimates vary as to how much small cells can help mobile network operators save on capital expenditure (capex) and operating expenditure (opex) because they base most of the estimates on a direct comparison of macro cell coverage with similar coverage by small cells. However, the best way to save on costs is to deploy small cells in a heterogeneous-network (HetNet) configuration and not on a stand-alone basis. HetNets let operators deploy macro cells for outdoor coverage and small cells for targeted capacity and coverage. According to at least one study, a HetNet configuration can save more than 8% in capex and more than 6% in the total cost of ownership versus a traditional macro cell configuration.[10]

These savings are expected to be even greater for high-density areas where both the cost of deploying a macro cell and the number of users benefiting from small cells are higher. Operators also can save significantly on opex by using small cells in customer premises where the customer pays the cost of backhaul and electric utilities. Operators just entering a market or those deploying new 4G technologies can use small cells to get more out of their existing networks before turning to costly capital outlays to expand their macro cell networks. Small cells are a relatively cost-effective solution that mobile network operators can adopt to meet pressing needs in the near- and the mid-term for networks to keep pace with customers' fast-rising demands.

### *Expanding coverage and capacity*

Due to their relatively low cost and easy deployment, small cells may be an especially appealing alternative to traditional macro cellular networks in densely populated areas with high-rise buildings. Small cells provide better in-building and cell-edge coverage. They also allow for a more targeted approach to coverage and better cellular network planning in areas with low mobility requirements. For example, consider a big convention centre covered by multiple macro cells where customers end up experiencing several handoffs while walking in the centre. If the centre is covered by small cells, customers will have a much smoother network experience with no macro cell handovers.

Small cells also give an added layer of resilience to the network. Macro cells, due to their outdoor nature, are more susceptible to natural disasters than are small cells. As customers require more reliable access to mobile networks, the enhancement to network coverage and resilience made possible by small cells becomes a competitive advantage.

*Increasing average revenue per user*

By offering more reliable service, small cell technology helps operators increase each customer's value. Whether operators continue to gain market share from fixed providers of residential telephone service or can respond more nimbly to emerging VoIP and Wi-Fi offerings, having stronger in-home and location-specific coverage creates new business opportunities and potential revenue streams.

*Reducing customer churn*

Small cells can help retain customers by alleviating quality-of-service issues that often make customers begin looking elsewhere. More than 40% of mobile users who experience dropped calls on a daily basis say they're likely to switch providers within 12 months; 28% of those experiencing dropped calls on a weekly basis also say they're likely to switch.[11]

*Improving energy efficiency*

Small cells are more energy efficient than macro cells. Beginning to deploy small cells and using them strategically can help network operators save substantially on energy costs – up to 70% overall. Historically, macro cell sites have used an average of 2.7 kilowatts per site, compared with as little as 5 watts for the latest small cells.[12] Higher-capacity small cells may use as much as several hundred watts, delivering energy efficiency in even high-use areas and in developing countries where unreliability of the electricity grid forces mobile network operators to spend heavily on diesel generators.

PwC co-workers, Istanbul, Turkey

## Roadblocks to navigate

Although mobile network operators see small cells as a beacon of hope, they have a number of associated challenges to address before they can take full advantage of small cells. Fortunately, new developments are giving way to solutions.

*Commercial*

Operators have limited experience with and are still developing an understanding of small cell deployment. They're often not fully aware of all the pricing and business models that can make the widespread use of small cells highly attractive. The dominant early pricing strategy has been to ask customers to pay for small cell deployment in their poorly covered homes or businesses. That approach reflects the mindset of a small cell being a quick fix versus a long-term foundation for a new network, organisation and business model. Even greater opportunity can be found by stepping back and visualising the potential benefits of deliberately shifting to an integrated, large-scale deployment of small cells throughout an operator's network.

Mobile network operators offer small cell solutions as a managed service comparable to the best-effort service offered by Wi-Fi. Although today many accept this best-effort approach, users have begun to demand a mobile broadband experience with the level of reliability they've come to expect from wired broadband. We also believe that subscribers will want a single number to call for customer service, which typically is difficult with Wi-Fi.

Seamless integration is a unique selling point for small cell solutions. In fact, more than half of US broadband households with mobile phones are interested in small cell benefits and are willing to pay for the devices and for any associated new services.[13]

But pricing strategy and market segmentation must be closely tied to precise market scenarios. Evidence shows that once one operator deploys small cells in a market, there's strong pressure on competitors to offer a rival service as a way of improving in-home and indoor coverage. As operators look to differentiate their services, they start making free offers. These free offers have become commercially viable as vendor competition and economies of scale help to drive down the cost of small cells. One Australian mobile provider, for example, offers small cells as part of a bundled service package to customers. Its future business models also could involve multiple stakeholders who are willing to invest jointly in infrastructure. Major US cable operators that have deployed joint Wi-Fi networks are a good early indicator of such innovative business models.

### *Standards*

Small cell deployment, management and even equipment need to be standardised. Equipment vendors offer small cells with differing configurations. Some of these are integrated and designed to operate with many wireless standards, while some are designed for only a specific standard. The fact that 17 large equipment vendors are embracing Small Cell Forum APIs to let companies avoid interference while pursuing various ways of gaining spectral efficiencies is a potential catalyst for more widespread adoption of small cells.[14]

### *Regulatory*

Because of strong demand and a short supply of spectrum, mobile network operators should move to shared-carrier small cell deployments. Operators also require an approach that allows small cells to work seamlessly across countries and regions, minimising configuration and special settings as well as operational costs. For example, the UK regulator, OfCom, has proposed allocating a portion (as much as 2 x 20 MHz) of the 2.6 GHz band for low-power use. Given the nature of cross-tier interference, spectrum allocation and co-channel deployments for small cells are needed, yet remain a challenge.

Small cells typically are subject to existing mobile regulations that were designed with macro cells in mind. That affects the deployment time frame and cost. Although a number of regulators are working with operators on more practical procedures, notification requirements for installations pose a major barrier to adoption. Starting the negotiation process early and understanding the implications of any regulatory proceedings that can be anticipated ensures a more favourable result.

A related issue is how operators should work with building owners that host small cells. In the US, for example, the old tenant-landlord relationships for macro cell deployments were based on high monthly rent and almost unlimited access to the premises. But that approach will have to be modified, as higher rent would make small cells uneconomical and frequent access to interiors of buildings would be inconvenient for the landlords. Only a new approach based on a mutually beneficial relationship such as shared backhaul or a beneficial customer experience will likely work.

### *Technical*

The biggest reason operators cite for hesitating to adopt small cells is interference. Although some companies are deploying small cells on completely separate frequencies than their macro networks, others lack the excess free spectrum they'd need. LTE Release 10 and other upcoming standards are equipped with Advanced Interference Management techniques that should help mitigate these issues. These standards are expected to be operational by 2014.

Similarly, a good proportion of the mobile backhaul market for macro cells is served by microwave links that operate over licensed spectrum that requires a direct line of sight. That doesn't work for small cells installed close to the ground. So, vendors are using millimeter-waves in high-frequency spectrum bands, such as those operating in the range of 70 GHz to 80 GHz, to deliver high-capacity links over short distances of roughly half a mile. Operators are considering many solutions such as this to overcome the challenge of deploying low-cost, high-capacity backhaul to small cells.

*Deploying and maintaining a network manually simply isn't scalable for large deployments of small cells. Small cells must be manageable, operable and even upgradeable remotely to keep them cost effective in the long run.*

*Perhaps the greatest challenge in adopting small cells is the fact that their success depends on rethinking the way operators deploy, manage and maintain them.*

But small cell deployments that require microwave backhaul can increase the time and cost of deploying, especially if a stand-alone microwave unit is to be installed at the small cell location. Even the use of Ethernet- and fibre-based backhaul for small cells becomes cost prohibitive if considered on a per-location basis without planning to make good use of macro cell backhaul.

Most current deployments of small cells support plug-and-play operation, with automatic configuration and network adaptation. These features allow for large-scale deployment. Deploying and maintaining a network manually simply isn't scalable for large deployments of small cells. Small cells must be manageable, operable and even upgradeable remotely to keep them cost effective in the long run.

To adopt small cells, operators also need to investigate their existing infrastructure and develop an appreciation for network innovations that effectively introduce a mix of small cells and macro cells. The rise of HetNets reflects the general movement towards plug-and-play small cells that can be deployed in varied numbers depending on the needs of local networks.

*Operational*

Perhaps the greatest challenge in adopting small cells is the fact that their success depends on rethinking the way operators deploy, manage and maintain them.

The processes for leasing, acquiring sites, getting permits, constructing, delivering backhaul, provisioning, monitoring, maintaining and repairing small cells must be tailored to their unique cost model. Sending field technicians to repair and maintain small cells, as is done for macro cells, would be cost prohibitive. The supply chain and logistics needs of small cells are closer to those of handsets than to macro cells. But many operators don't have enough experience in managing such dynamic and cost-sensitive supply chains. Simply layering legacy approaches and organisations on small cells will do nothing but make their use infeasible.

Innovative deployment plans are critical for small cells to succeed. For example, operators could partner with shopping mall owners to deploy small cells for use by the mall's customers. This would help maintain indoor coverage and capacity in the venue with an acceptable quality of service, and would minimise the capex for both parties. For backhaul, operators could piggyback on the mall's existing infrastructure to further minimise capex and opex.

New and low-cost operating models are equally critical to successfully deploying small cells. Operators will need processes and systems that seamlessly integrate macro cell and small cell infrastructure and management. The operators will benefit from creating an integrated deployment and maintenance plan for their HetNets, where small cells could make use of the macro cell infrastructure (wireline/wireless backhaul, co-location, electricity, security, etc.).

Auto-identification and GPS-based asset tracking, which operators have been adopting slowly for their macro cellular network assets, is a must to keep track of the hundreds of thousands of small cells operators have begun to deploy. Otherwise, operators risk higher operating costs and, in worst-case scenarios, bad publicity for being viewed as abandoning their assets with no regard for creating eyesores and potential environmental damage. Equipment vendors must start making tools and approaches for managing these assets effectively a critical part of the total solution. What's critical is to minimise manual intervention, use macro cell infrastructure and adopt new tools for a successful small-cell operation.

## Small cells point the way to big opportunities

Some analysts estimate that the size of the small cell market will be US$14bn by 2015.[16] Leaders will seek to address both the operational and the commercial barriers to deploying small cells, from marketing and pricing schemes to integration into their overall infrastructure management strategy. And they could gain a distinct competitive advantage from saving on costs as well as by providing their customers a reliable, high-quality mobile Internet experience in spite of the mounting risk of a spectrum shortage.

Looking ahead, mobile network operators can find new approaches both to creating additional revenue streams and reducing capex and opex through innovative partnerships. Operators must find a way to run an integrated, heterogeneous network of Wi-Fi hotspots, macro cells, and small cells at a much lower unit cost than today's macro cellular networks. Doing so will be difficult without setting aggressive targets and having the right decision-making tools for attaining those targets.

Likewise, mobile network equipment vendors have an opportunity to provide decision-making and operational tools to strengthen deployment and operation. For example, new network planning tools to improve investment and coverage/capacity trade-offs, taking into account all the elements of a HetNet and operational support systems for managing remotely.

Small cells are rapidly shifting from an outlier strategy to a mainstream tactic of leading mobile network operators. In the next six to twelve months, operators and vendors will need to seriously consider a new approach to network deployment, including focusing on small cells. From negotiating leases to considering systems and tools to incorporating small cells into networks and businesses to honing marketing messages to make sure customers understand how they benefit from small cell technologies, the challenges remain significant. But much bigger are the potential opportunities.

## *Footnotes*

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14 PC World News: 17 equipment vendors embrace Small Cell Forum APIs (http://www.pcworld.com/article/250866/small_cell_forum_pushes_progress_beyond_femtocells.html, Feb 28, 2012).

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Covered market, Istanbul, Turkey.

# The scale of the capex challenge

*The telecoms industry is at an inflexion point. It's spending lots of money on new infrastructure, but it isn't optimising returns on its investment. And most telecom executives admit as much, saying that the process of allocating and managing capital is both deeply flawed and deeply frustrating. Yet very few companies did anything to tackle the problem during the good times. Only now, as the markets mature and the quick wins on operating expenditure dry up, are a small but growing number of operators trying to crack the 'capex code'.*

**by Gary Taylor and Trigvie Robbins-Jones**

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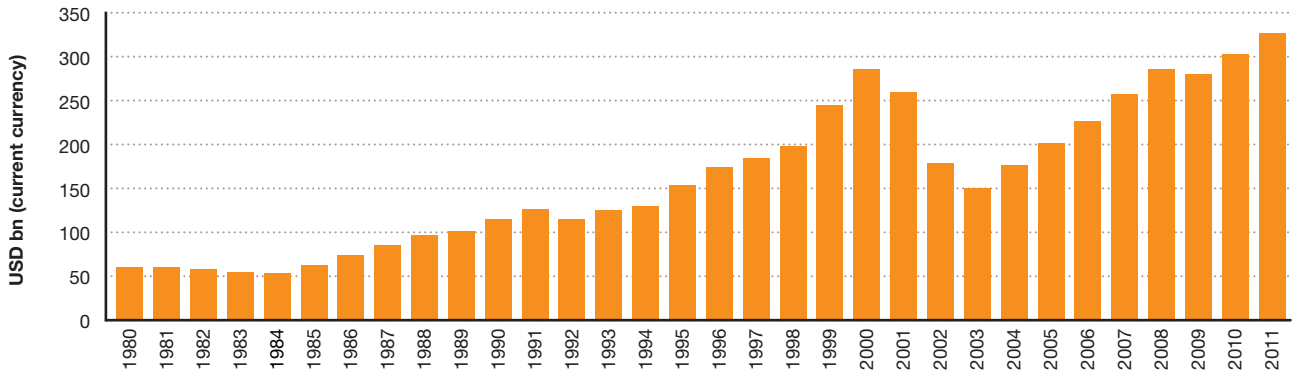
The authors wish to thank Iulia Avramescu, Anna Abramova and David Russell for their invaluable contributions to this article.

'Maman' by Louise Bourgeois, Guggenheim Museum, Bilbao, Spain.

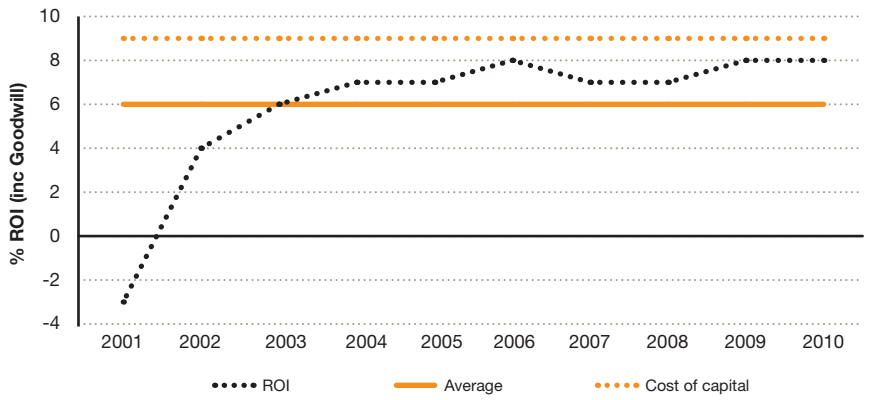
According to an old saying, 'what goes up must come down' – but that doesn't seem to apply to capital expenditure (capex) in the telecoms industry. In the past 30 years, as Figure 1 shows, global capex levels have soared from just over US$50bn to about US$325bn in real terms. They dipped briefly in the early part of each decade and at the height of the financial crisis in 2009, before resuming their relentless rise. Indeed, only once since 1945 have total capex levels fallen by more than 5%.Yet this massive investment isn't producing the returns the industry requires. PwC studied the financial performance of 78 fixed-line, mobile and cable telecom operators around the world that have a collective annual capex of some US$200bn. That amounts to nearly two-thirds of the industry's total spending in 2011. (For details on our methodology, see About the research.) Our research reveals that in the past decade the average long-term return on investment has been just 6% – three percentage points less than the cost of the capital itself (see Figure 2).

**Figure 1: Global capex levels in the telecoms industry**




Source: PwC analysis.

**Figure 2: Average returns on investment**




Source: PwC analysis.

## Why telecom operators allocate capital inefficiently

We interviewed 22 telecom executives from a representative cross-section of companies and regions to get a better picture of what lies behind the industry's financial performance. Their comments suggest four reasons that explain the inefficient allocation of capital (see Figure 3).

**Wrong investment criteria.** Nearly two-thirds of the executives we talked with told us they plan their capex as much by technological considerations as by business outcomes. If you're unsure whether that applies to you, then take this simple test: Is your capex plan set out against each of your technology domains (access, aggregation, core, transmission, IT etc.)? If yes, then you're in the first camp. You've left your execs with a series of false choices since serving customers isn't possible with, say, core but no access.

Capex planned according to business considerations, on the other hand, establishes funding requirements for mutually exclusive business objectives. Those might be to expand 50mb broadband, upgrade SME Ethernet or simplify aggregation to reduce unit costs.

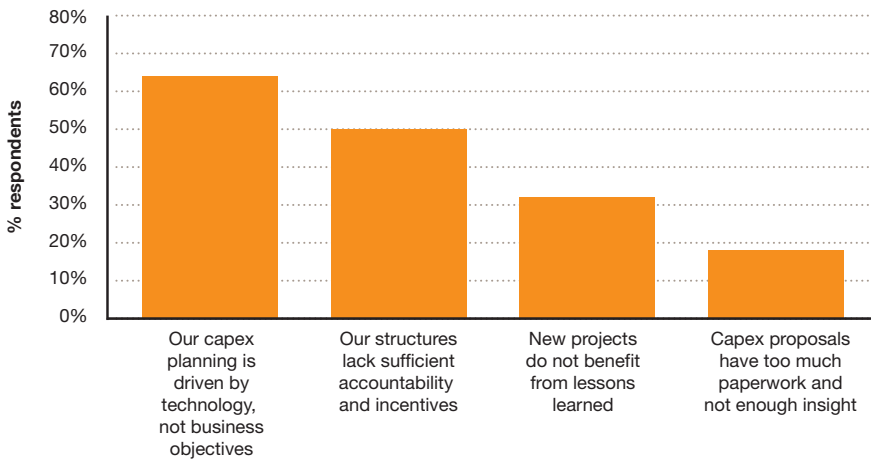
Take the case of one very well-regarded Western European incumbent. Its strategy and business and market planning are all high quality and focused on the future and on customers. It also produces robust forecasts of customer numbers, revenues and earnings before interest, taxes, depreciation and amortisation (EBITDA).

That's all as it should be. But then employees in the networks and IT functions look at the performance statistics, talk to vendors and estimate the capex implications of the business plan. Inevitably, this produces the 'wrong' answer, with cash and EBITDA forecasts outside guidance. And so the bickering begins. The result, after numerous iterations, is a 'political' compromise that inspires little confidence and cements a culture of divisions through one of confrontation.

There's much to regret about such a process. But perhaps the most insidious effect is that the people in the networks and IT functions are left with a capex budget they may not believe in and can't fully control. Much that influences capex – subscriber numbers, traffic levels and usage patterns – lies in the hands of other teams. Yet, regardless of determining factors, the networks must support the traffic that comes through.

**Insufficient levels of accountability.** Technology-driven capex planning is by no means the only problem. Half the telecom executives we spoke to said that their organisations have too little accountability for capex. Some confine assessing the results to large projects. Others attribute capex to specific business units and measure the return

**Figure 3: The root causes of inefficiency in allocating capital**




Source: PwC analysis.

*In our company there's still a bit of the 'build it and customers will come' mentality. But those days are gone. If we build the wrong thing in the wrong place or at the wrong price, the customers won't follow. So, rather than letting technology drive our capex decisions, we need to adopt a more commercial approach.*

*— Executive at fixed-line incumbent*

but don't enforce the practice widely. And in the very worst cases, the return on investment (ROI) is recorded only at the corporate level (see Figure 4).

This lack of accountability is often a consequence of the technology-led capex approach we've already described. Most of the telecom operators in our survey distinguish between business-as-usual capex (sometimes called baseline or production capex) and project capex (also known as innovation or growth capex). Project capex typically represents just 20-30% of an operator's total capex, yet it receives 80-90% of the capex committee's attention.

In the vast majority of companies, all applications for project capex must be supported by clear evidence of how a proposed project ties in with the company's strategy and business priorities. And the capex committee will happily send weak proposals back for additional work or will reject them altogether.

Business-as-usual capex, by contrast, is treated in a far less sophisticated way. The networks generally submit requests for RAN consolidation, core upgrades, additional carriers or whatever else they need to support an increase in traffic. But since the link between traffic and value has been broken at the planning stage, these capex proposals are effectively 'technical costing' papers based on the assumption that the additional traffic will be profitable.

The finance function or capex committee might ask a network to investigate different vendors, challenge the timing of the investment or even query the need for it. But the committee rarely asks – let alone gets answers to – the obvious questions about baseline capex. Is the extra traffic part of a profitable service? Is it being generated by profitable customers? Will it produce a positive return on investment?

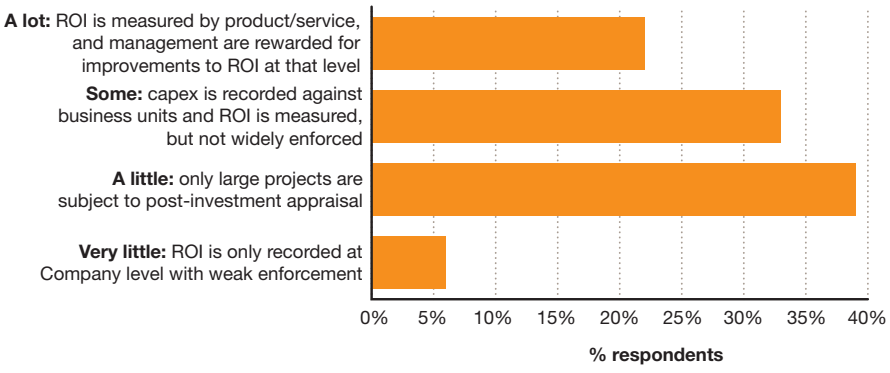
Of course most of the respondents in our survey recognise that not all traffic is equal. Yet, for many, this remains an intellectual fine point. The leading operators behave quite differently. They analyse their business-as-usual capex very carefully to make sure that it will create real value.

Many respondents are also keenly aware that where accountability for capex does exist, it often resides in the wrong place. "Capex cases should be presented by marketing and sales people, not technology and engineering people," an executive at one incumbent operator in the Middle East and Africa noted.

Even when the right people are involved, they're often given the wrong incentives. "Marketing and product management aren't rewarded on capex but on revenue and EBITDA," an executive at a quad-play operator in the Americas explained.

Taken together, those two observations highlight just how embedded in the telecoms industry the obstacles to improving returns are. In most

**Figure 4: Levels of accountability for ROI**




Source: PwC analysis.

*There's no accountability for results in the business. We're never able to measure the real return on our investments. It's too difficult when so many different factors are involved, and the results wouldn't be credible, so it's seen as a waste of time. With cutting-edge projects, we're also under so much pressure to get to market ahead of our competitors that we don't run the projects properly from a capex perspective.*

*— Executive at tier 1 quad-play*

companies, a network has to solicit support for its capex proposals from the product management, sales or marketing function. But it's easy to get such support from a team that's rewarded for increasing subscriber numbers, revenues and EBITDA.

A coalition results, one between a network that wants to maximise its operational performance and a marketing function that wants to maximise revenues. Whether or not the proposal makes commercial sense, the coalition is biased in favour of it. Worse still, responsibility for the ROI is diffused. It's often passed to the finance function, which has even less control than the other parties have.

"No one's happy with this situation but it's difficult to fix," an executive from a global mobile telecom company remarked. "There's a lack of planning between the business teams and the IT delivery team. We don't take sufficient account of unknowns. Commissioning departments typically understate the scope of what they want to do [because they don't know how to specify correctly] and then there are always cost overruns, which mean the numbers always look bad."

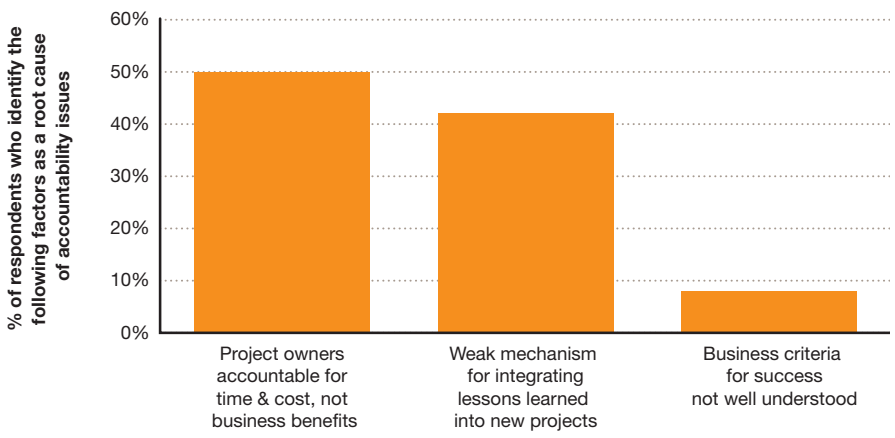
**Failure to learn from the past.** Failing to focus on the right investment criteria and to make the right people accountable is compounded by failing to learn from the past. A third of the executives we surveyed said their companies haven't learned from experience. That's sometimes because success is defined narrowly enough that if a project comes in on time and within budget, it succeeds. Yet the real issue is whether a project has delivered the benefits that were envisaged. Also, many telecom companies have weak mechanisms for integrating the lessons from earlier projects into new ones, and some don't have a clear grasp of the goals they want to achieve (see Figure 5).

One classic bugbear – especially for the finance function – is the inability to perform proper post-investment reviews. Without such reviews, looking back and learning is difficult. But inadequately assessing prior spending is only a symptom of the disease, not the disease itself. That lies further upstream. When capex planning takes place in parallel with budgeting, networks are responsible for budgets they can't completely control; business-as-usual capex isn't subject to the normal checks; and accountability is split between divisions. It's impossible to disentangle the benefits of any one investment.

How can these problems be resolved? There are two questions to ask during the capex planning process that get to the heart of the issue.

The first question to ask is, should a particular investment be made at all? The majority of operators have a long tail of marginally profitable – or downright unprofitable – products, networks, customers, channels and segments. A request to invest further in any such assets is an obvious point at which to consider terminating, migrating or consolidating them. Yet

**Figure 5: Why telecoms operators don't learn from the past**




Source: PwC analysis.

telecom operators are notoriously slow to prune their product portfolios. Rarely do they use investment cases as an opportunity to review the basic assumptions underlying the different parts of their business.

The most common reason for skipping this step is simply lack of good information; without reliable facts, capex proposals and challenges become politicised, arbitrary and inefficient. In our experience, the antidote to making flawed decisions is to create a base of facts about the (post-capital) economic profitability of products, network, customers, channels and segments. That delivers two advantages: capital is diverted away from low-growth, marginally profitable activities, and the business case for network and system convergence is strengthened.

The second question to ask is, can existing assets be reused or recycled? In other words, can the investment be deferred? One of the most common claims used to support an investment case is that the investment is necessary because the network is congested. And often that's correct – capacity upgrades are a fact of life for all operators. But it's also true that operators regularly have hidden capacity masked by incomplete, inaccurate or unconnected databases.

Here's an example of what we mean. A leading European network operator had spent more than US$2.5bn on capex since it was launched. But as it grew, the operator wasn't particularly concerned about controlling its costs or ensuring the financial accountability of the project managers responsible for buying network assets. That led to very poor information about its network inventory and infrastructure.

So, using common reporting and data control frameworks, the company embarked on a major programme to improve the consistency of the data and to harmonise the processes the finance and operations divisions used. This programme paid off, by keeping the company from erroneously writing off 5% of its accumulated network asset base. And the following year, the programme helped in cutting capex by more than US$25m, as a result of identifying stranded assets, capturing unbilled services and preventing duplicate out-payments.

**Lack of insight.** The last reason why so many telecom companies allocate capital inefficiently is because they confuse information with insight. All operators recognise the importance of allocating capital and employ teams of analysts to evaluate the capital projects they're considering. Many executives find the reams of paper these teams produce reassuring because they think it means every angle has been covered. But generating paperwork can be a way to avoid addressing the difficult questions: is this investment simply propping up an unprofitable segment? what's the evidence for our assumptions? what options haven't we explored?

A related issue has to do with the decision-making process itself. Most operators currently rely on a sort of courtroom approach of cross-examining the advocates and eventually reaching a judgement. They treat capex planning as a process of recommending and qualifying to find the answer. But when capital projects are seen as milestones in developing a strategy, they become opportunities to explore the trade-offs inherent in every allocation of resources.

Consider how one European operator handled its next-generation access plan. Its competitors had already upgraded their networks and had spoken in public of the benefits. Primary research confirmed that consumers wanted faster services, and case studies from other markets offered a precedent for how quickly consumers were likely to embrace the services.

*The biggest barrier is the sense of entitlement in those asking for capex each year. They have the attitude: 'I had the money last year, so I must get it this year.' It's a big game for a lot of the groups. The people that ask for the most and shout the loudest get the most. That's just not right.*

*— Executive at a mobile operator*

*Scrutiny at the back end is too late. People come and ask for forgiveness when things have gone wrong. What we want is for them to get permission first. That way is better. We need everyone to understand that this isn't 'our' money!*

*— Executive at alternative operator*

The network operations division could point to network congestion, the product management division could point to competitive pressure and the business planning division could see the strategic advantages. There was just one problem: the projected ROI was very poor.

When we analysed the investment case, though, we discovered a methodological flaw. The various parts of the business were all keen to get the investment approved, so they made optimistic assumptions about the speed of take-up. That, in turn, inflated their forecasts about the additional capacity that would be required and the incremental average revenue per user that would be generated. Uncovering this information – rather than destroying the investment case, as its advocates had expected – opened up a new option: namely, to stage the rollout.

Deferring the second stage of investment would increase the total bill. But it also would add five percentage points to the internal rate of return, reduce the operational risk associated with a 'big bang' launch and provide better financial control by linking the second stage of expenditure to the success of the first. Given these findings, the investment committee was happy to go ahead with a phased approach.

This example illustrates how the search for a single answer can backfire. How it encourages the advocates of an investment case to close in prematurely on one way forward and then defend that way at any cost. But a company that keeps its options open and analyses its most critical underlying assumptions is better able to generate the insights it needs. The project's advocates are spared from having to take responsibility for assumptions that can't be proved, and they get the opportunity to raise strategic issues in the appropriate forum.

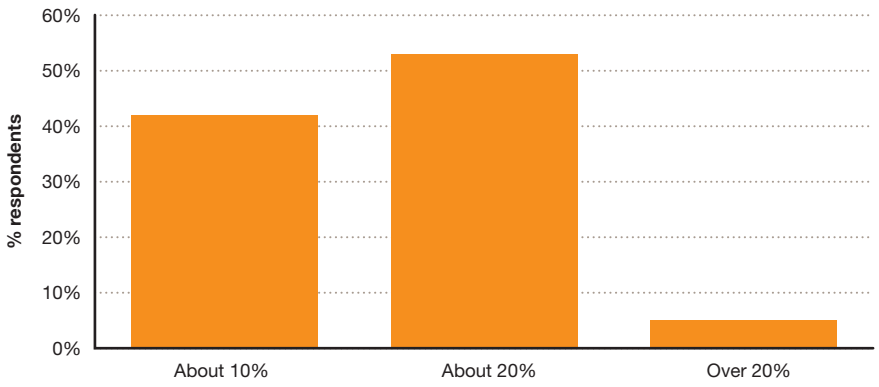
## How operators misallocate billions of dollars of capex

A poor decision-making process can cost. And in an industry that invests as much as telecoms does, the total cost can be very large indeed. More than half the respondents in our survey estimate that they spend about 20% of their company's capex on assets that don't recover their cost of capital (see Figure 6).

Those figures are consistent with the fact that the industry generates average returns of 6% on capital that costs 9%. The misallocated capital appears to generate absolutely no return. What's more likely, as one survey respondent noted, is that about 70% of investments cover their cost of capital and about 30% generate very poor returns indeed. The difference is easy to explain. We calculate that most telecom operators misallocate about 20-22% of their discretionary capex. But when the non-discretionary capex they're required to make for regulatory reasons is included, the percentage rises to about 30%.

So, what are the implications? If the industry invests about US$325bn a year on capital projects and generates returns that are equivalent to nil on 20% of its investment, it's effectively wasting about US$65bn a year. That's more than the entire revenue generated by the global video games market in 2011 (US$59.3bn), according to PwC's *Global Entertainment & Media Outlook 2011-2015*. This figure includes consumer/end-user spending of US$57.2 billion and advertising revenues of US$2.1 billion. In fact, it's enough to run point-to-point fibre to every home and business in Britain (at a one-off cost of about US$50bn) and still have some spare change.

**Figure 6: The proportion of annual capex spent on assets that fail to return their cost of capital**




Source: PwC analysis.

## What winners do well

Our analysis of the financial performance of 78 telecom operators around the world shows some significant variations in how well they're doing. From talking in-depth with 22 senior industry executives we uncovered major differences in the way they manage their capex. In the course of these discussions, we identified 12 attributes the telecom companies that allocate capital most efficiently share (see Figure 7).

Collectively, those attributes form the building blocks of a well-designed capital management programme.

We also divided the telecom companies participating in our survey into two segments: those that have markedly

**Figure 7: The 12 attributes of capital excellence**

| Management practices | | Underperformance | Emerging best practice |
|---|---|---|---|
| Plan | Performance metrics | BU's define success as revenue, EBITDA, utilisation and cost reduction | BU's define success as value such as capital value or ROI |
| | Setting capex levels | Sets capex levels with reference to last year's spend or capex/sales benchmarks | My organisation knows how much capex optimises ROI |
| Organise | Budget owners | Capex budgets are justified simply if they are within a department's budget | All Capex is grouped in consistent, measurable, testable business drivers |
| | Responsibility | Engineering and operations take responsibility for delivering on time and within budget | Business unit leaders are responsible for delivering the intended business outcomes from capex spend |
| | Project scope | Capex budgets are justified with engineering metrics only such as utilisation | Capex projects are justified with value-based metrics such as product or regional ROI |
| Build | Capex projects | Capex projects are broken down into technical components to avoid scrutiny | All capex projects are driven by products, segments and regions |
| | Proposal evaluation | Capex proposals come with a single recommendation | Proposals come with a clear explanation of the alternatives of each option |
| | Business cases | Proposals leave key assumptions unstated | Proposals come with good evidence for assumptions |
| Operate | Procurement | Procurement decisions are made on the basis of the lowest unit cost | Procurement decisions are based on maximising the intended business outcomes over unit costs |
| | Fixed asset register (FAR) | The FAR does not reconcile with operational systems leading to adverse audit findings | The FAR captures asset information at the same level of detail as the capex planning tool |
| Respond | Post investment appraisal | The business defines project success simply in terms of on time and within budget | The business has a formalised post-investment appraisal process to share best practice in achieving business outcomes |
| | Reporting | Key management reports focus on 'pre capex' KPIs such as subs, revenue and EBITDA | Key management reports focus mostly on 'post capex' KPIs such as capital value or ROI |
| | Rewards | BU leaders, engineers and finance are rewarded on the basis of measures, such as revenue, utilisation and cost reduction | Senior managers are all rewarded on value based objectives such as increase in capital value or ROI |

Source: PwC Telco Capex benchmark study 2012.

## *Starting small yields big wins*

It's easy to feel overwhelmed by the scale of the challenge involved in improving your capital management, so where should you start? One former incumbent – now providing communication and entertainment services in an intensely competitive market – decided to begin by focusing on a specific line of business.

The company's revenues were static and its profitability was declining. Yet much of its capex was still going to day-to-day business, leaving little to fund the 'big bets' critical to its business strategy. With competitors circling and with investors querying both the slowdown in rolling out fibre and the outlook for dividends, the case for change was compelling.

Internally, too, dissatisfaction was rife. The networks were disgruntled with the marketing function's 'unreasonable' quality-of-service demands; the marketing function was unhappy about the lack of information on service availability; and the capital management team was concerned because it lacked the information needed to test its suspicion that many of the capex proposals it received were destroying value. Meanwhile, the technology department continued investing its business-as-usual capex by using the same input based on capacity.

The chief finance officer was well aware of these problems and deeply frustrated by them. So he created a team of people from the finance, marketing and technology functions for one line of business to catalyse the needed changes.

The team started by diagnosing the existing performance gaps. Then, drawing on external expertise, it identified the building blocks of best practice. This process helped everyone understand what was going wrong. The people from the finance function realised they'd been operating reactively to each crisis, and those from the technology department realised they weren't using the finance function to support their forecasting and investment decisions.

Next, the team focused on how to redeploy 20% of the business unit's capex for growth initiatives, and on crafting a plan to upgrade its capital management. Thanks to a common vision that spanned the major departments, the team was able to develop a better approach within ten weeks. The antagonistic relationship that had prevailed, with the finance function scrutinising what the networks delivered, was replaced by one in which they collaborated on deciding where to direct capex.

This template proved so successful that the chief financial officer was able to persuade the chief technology officer of its potential for the rest of the business. And, together, the two were able to show the chief executive officer how they'd solved the capex challenge.

Scenic view of More, London, England.

and consistently improved their capex performance over the past decade, and those that haven't. We then measured how these two segments behave with regard to each of our 12 attributes of capital excellence (see Figure 8).

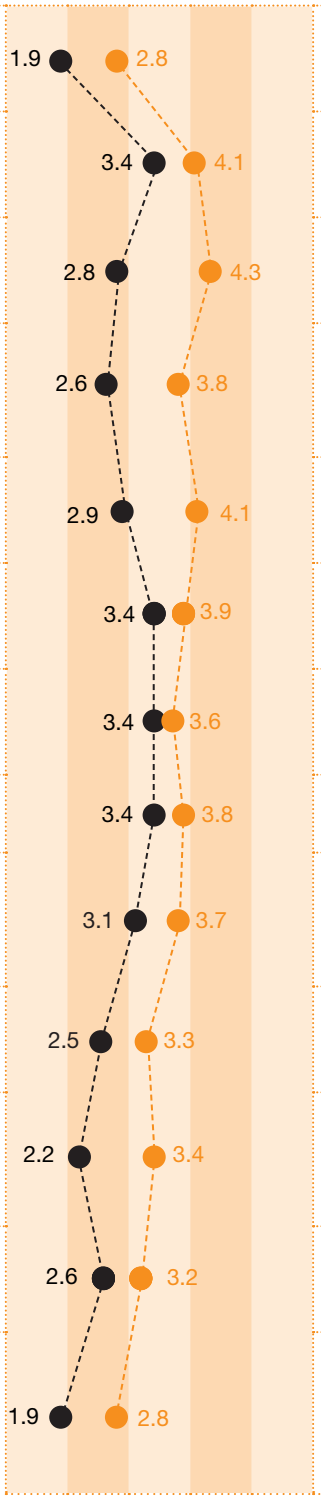
The most striking disparities between operators that allocate capital efficiently and those that don't occur at either end of an asset's life cycle: in how they plan and organise investments, how they report on that expenditure and how they reward the employees responsible for managing it. Our research found some less obvious but significant differences in the middle stages too.

The leading operators set themselves more demanding targets at each endpoint in the planning, organising and responding phases. Not only do they aim higher, but also they have higher expectations of the building and operating phases that connect these endpoints. Starting with the endpoints, then, normally is best when designing a more robust capital operating model, since that's the most effective way of highlighting deficiencies in the 'connecting' steps that make it possible to reach targets as well.

Our data clearly demonstrates that making the effort to improve your company's capital management is worthwhile (see 'Starting small yields big wins'). The top quartile of telecom operators in our survey have more mature capital management practices. They also report less misallocating of capex, enjoy a better ROI and deliver superior returns to shareholders.

## Figure 8: What winners do well

| Management practices | | Underperformance | 1-5 Maturity level | Emerging best practice |
|---|---|---|---|---|
| Plan (average gap=0.8) | Performance metrics | BU's define success as revenue, EBITDA, utilisation and cost reduction | 1.9 / 2.8 | BU's define success as value such as capital value or ROI |
| | Setting capex levels | Sets capex levels with reference to last year's spend or capex/ sales benchmarks | 3.4 / 4.1 | My organisation knows how much capex optimises ROI |
| Organise (average gap=1.3) | Budget owners | Capex budgets are justified simply if they are within a department's budget | 2.8 / 4.3 | All capex is grouped in consistent, measurable, testable business drivers |
| | Responsibility | Engineering and operations take responsibility for delivering on time and within budget | 2.6 / 3.8 | Business unit leaders are responsible for delivering the intended business outcomes from capex spend |
| | Project scope | Capex budgets are justified with engineering metrics only such as utilisation | 2.9 / 4.1 | Capex projects are justified with value-based metrics such as product or regional ROI |
| Build (average gap=0.4) | Capex projects | Capex projects are broken down into technical components to avoid scrutiny | 3.4 / 3.9 | All capex projects are driven by products, segments and regions |
| | Proposal evaluation | Capex proposals come with a single recommendation | 3.4 / 3.6 | Proposals come with a clear explanation of the alternatives of each option |
| | Business cases | Proposals leave key assumptions unstated | 3.4 / 3.8 | Proposals come with good evidence for assumptions |
| Operate (average gap=0) | Procurement | Procurement decisions are made on the basis of the lowest unit cost | 3.1 / 3.7 | Procurement decisions are based on maximising the intended business outcomes over unit costs |
| | Fixed asset register (FAR) | The FAR does not reconcile with operational systems leading to adverse audit findings | 2.5 / 3.3 | The FAR captures asset information at the same level of detail as the capex planning tool |
| Respond (average gap=0.9) | Post investment appraisal | The business defines project success simply in terms of on time and within budget | 2.2 / 3.4 | The business has a formalised post-investment appraisal process to share best practice in achieving business outcomes |
| | Reporting | Key management reports focus on 'pre capex' KPIs such as subs, revenue and EBITDA | 2.6 / 3.2 | Key management reports focus mostly on 'post capex' KPIs such as capital value or ROI |
| | Rewards | BU leaders, engineers and finance are rewarded on the basis of measures, such as revenue, utilisation and cost reduction | 1.9 / 2.8 | Senior managers are all rewarded on value based objectives such as increase in capital value or ROI |



Source: PwC Telco Capex benchmark study 2012.

Average of 'Others' — Average High Performer

## *Conclusion*

The telecoms industry has a long history. Even the companies that came late to the mobile telecom market are now more than 20 years old. But the capital operating model that's emerged over the decades is no longer serving the sector well – if, indeed, it ever did. Most of our respondents describe their process as unstructured, politicised and inefficient. It's a process that wastes some US$65bn a year.

What's true for the industry as a whole, though, is certainly not true for every participant. A small cohort of fixed-line, mobile and cable telecom players have consciously redesigned their capital operating models. They track and measure their ongoing capex; analyse it to identify where they can release resources for other projects; establish clear accountability; and use incentives to encourage smarter behaviour.

Making such changes is neither easy nor quick, but the rewards more than compensate for the effort that's required. Cracking the capex code lets a company invest its resources where they're most needed, prepare for the future more effectively and position itself to win in an intensely competitive marketplace.

### About the research

*We analysed the financial performance of 78 fixed-line, mobile and cable telecom operators around the world, using information drawn from Standard & Poor's Capital IQ database. (Equipment manufacturers and handset vendors were excluded from our study.) All the companies in our sample have an enterprise value of more than £250m and a full ten years worth of financial data. Collectively, they made capital investments of about US$200bn – or, 62% of the industry's total US$325bn capex – in 2011.*

*We also interviewed 22 senior telecom executives from companies whose size, services, location and financial performance represented a cross-section of the industry. We completed those qualitative interviews in January 2012.*

*The information these executives supplied enabled us to analyse the performance of their companies in detail. We also were able to give them additional insights, including information on the specific metrics and incentives that constitute best practice; how investors view companies with well-designed capital operating models; and how to improve their capital operating models. We're deeply grateful to the executives who participated in our study.*

# *Navigating the digital media ecosystem in emerging markets*

*In developed markets, mobile operators have largely missed the digital gold rush that device manufacturers and software players have captured. But in emerging economies, the opportunity for capturing these new revenue streams remains. Historically, mobile network operators (MNOs) have looked at the digital market simplistically, as a collection of distinct products that interact with and affect each other. The digital market, though, really is more of an interdependent and evolving ecosystem.*

*In our view, by looking at digital markets in emerging economies as inter-reliant networks, MNOs can fuel greater revenues with increased data usage and can put themselves in a better position in the wider value chain to find new revenue opportunities. Because the growth of MNOs' traditional revenues (voice and SMS) is slowing, and because emerging economies increasingly are adopting Internet-enabled devices, revenue from data as well as from new sources is becoming more important and more accessible. An environment is developing that shares many of the characteristics seen in the US and Western Europe three to five years ago.*

**by Brian Potterill and Henri Tran**

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The authors wish to thank Huw Thomas for his contributions to this article.

Iguazu Falls, Brazil.

The advent of the smartphone in developed economies has shown us that mobile devices are evolving. Once simply a tool for communicating, they now are personal computers that encompass communication, social activities, work and more. For smartphone users, basic communication is no longer the core function. In the UK, for example, smartphone customers spend on average only about 16% of their device time phoning and texting, and the remaining 84% on web browsing, social media, music and games.[1]

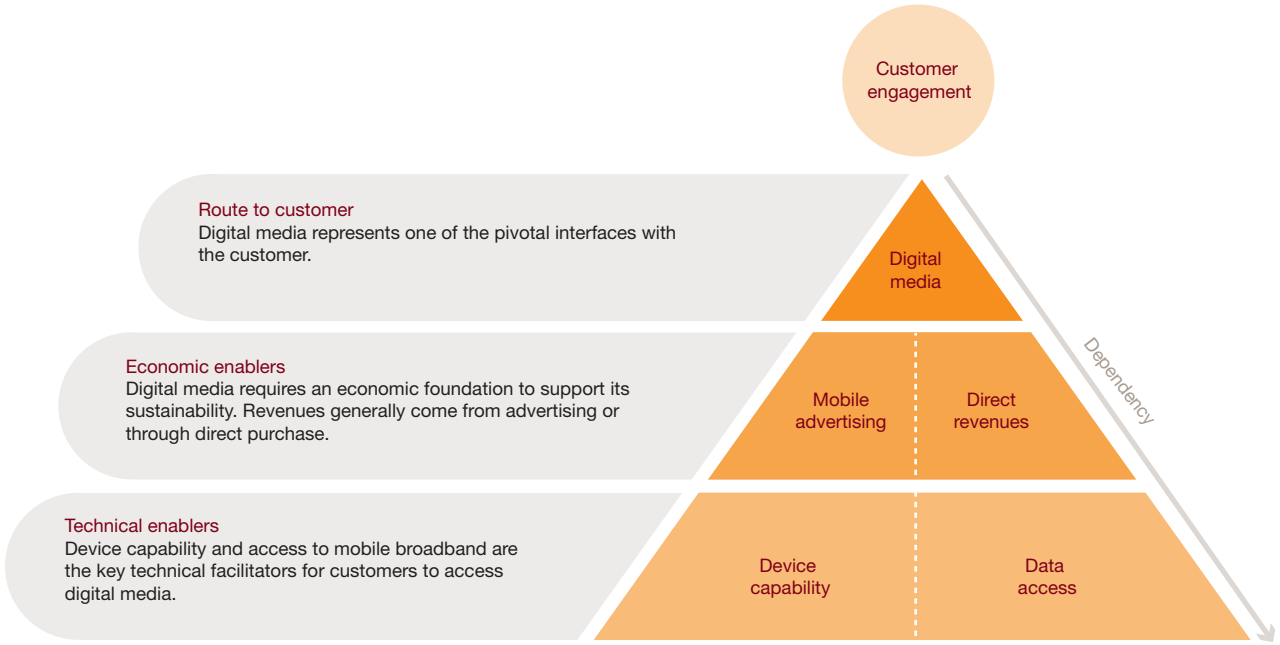
This increasingly dominant interaction with digital media spearheads customers' engagement with the mobile digital ecosystem more broadly (see Figure 1). In the context of this article, digital media refers to the broad range of digital information that consumers can engage with through their smartphone or tablet, including applications, music, games, videos and web browsing.

Figure 1 illustrates how digital media depends on other products and services. First, it relies on the ability of the devices (notably smartphones and tablets) to support consumption by letting customers connect to the Internet and access data through mobile broadband coverage. Second, digital media on the whole depends on each of its various forms being economically viable. Application developers, musicians, publishers and other owners of mobile content require revenue streams sufficient for them to continue providing these products. Revenue tends to come either directly, through consumers purchasing content (making payments upfront or through a 'freemium' model), through advertising revenues or through a combination of the two.

The symbiotic relationship of digital media to other products and services at work:

- The emergence of data access and smartphones has created a platform for customers to consume digital media.
- Digital media engages customers, which means that indirectly it supports further demand for devices and data access which support it.
- The economic success of digital media depends on generating revenues, so developers are making the most of consumers' engagement with digital media to create new revenue streams, such as mobile advertising.

**Figure 1: Digital media spearheads customer engagement but is highly dependent**




Source: PwC's analysis.

We believe that a similar model is likely to develop in emerging economies too. In the past ten years, mobile devices have become pivotal to the business and personal lives of those in emerging economies. According to the World Bank, mobile subscription penetration across Sub-Saharan Africa, for example, rose from 2% in 2001 to 53% in 2011; and the Middle East and North Africa saw a rise from 5% to 99% in the same period. Mobile phones have been used in novel ways, such as the basis for rudimentary banking and financial transactions. More formalised services such as M-PESA in Africa and GCASH in the Philippines have helped add security to transactions in countries that have a predominantly unbanked population.

Making connectivity and communication more affordable to individual citizens has brought huge economic benefits. The World Bank estimates that when low- to middle-income economies increase their Internet penetration by 10%, they can expect a 1.4% increase in the country's gross domestic product per capita.[2]

The next wave of development is coming from the transition from traditional (voice) mobile devices to Internet-enabled devices, namely smartphones. In emerging markets, the growth in mobile versus fixed-broadband penetration – combined with the decreasing cost and the increasing processing power (and hence capability) of devices – is fuelling the transition. The result is a leapfrogging of the personal computer era, in which smartphones and tablets are becoming the predominant computing platform in these markets.

*The World Bank estimates that when low- to middle-income economies increase their Internet penetration by 10%, they can expect a 1.4% increase in the country's gross domestic product per capita.[2]*

The higher comparative costs of installing fixed-line versus mobile broadband further discourages operators from investing in fixed-line broadband. So mobile broadband is vastly outpacing fixed-Internet subscriptions in the developing nations (see Figure 2). In Kenya, for example, 99% of Internet subscriptions are on mobile phones.[3] And the World Economic Forum projects mobile broadband to represent 84% of total Internet connections in emerging regions by 2016.[4]

Declining prices – apparent in smartphone handsets selling for less than US$100 – are making mobile devices increasingly accessible to customers in developing markets. In 2015, for example, it's expected that 340m Android devices priced under US$150 will be shipped globally.[5] The result is subscribers switching from legacy mobile devices to smartphones. For example, in South Africa the smartphone penetration rate is 15%, in Brazil, 12%; and in Russia, 11%.

Collectively, these trends are contributing to the smartphone becoming the primary method of Internet access for these nations in the coming years.

## Finding revenue opportunities in latent demand for digital media

Mobile network operators (MNOs) and device manufacturers, in particular, find digital media of interest because of the secondary revenues it creates. For the MNO, the more individuals engage with and download content, the more data they use (smartphones can generate up to 35 times the level of data traffic that a basic-feature phone would use). For the device manufacturer, the content available can be a pivotal reason why a consumer purchases a specific handset.[6] A recent study of consumers in Russia, India and Brazil suggests that better Internet access and the ability to use applications are the two primary reasons for buying smartphones, and this is contributing to increased data usage.[7]

Smartphones are inducing new habits among users with, on average, 20% starting to use data-intensive applications related to video, TV, maps and navigation since purchasing their device.[8] In emerging markets, where the average revenue per user already is low, the potential data revenues can help increase per-customer spending (see Figure 3) in two phases. In the first phase, more existing customers will adopt data bundles. In the second phase, increasing their use of data will inspire customers to buy larger bundles.

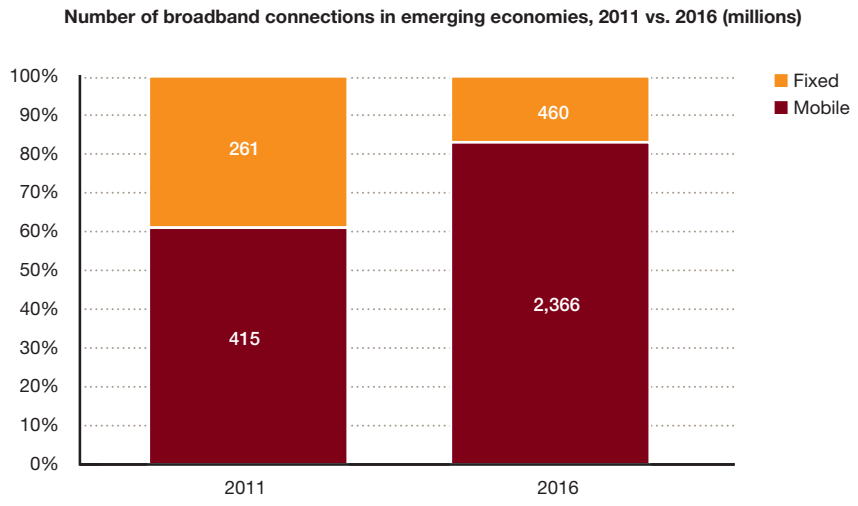
## The model for delivering content: short-term vs. long-term effectiveness

Many MNOs in both developed and emerging markets have tried to stimulate consumption through selling content to consumers. That's understandable in an environment where smartphone and mobile-broadband penetration are yet to take a significant share of subscribers. Without mobile broadband, getting content to customers is mostly about the network, as customers rely on voice or SMS to receive updates or content.

Similarly, for a lot of emerging economies, a large percentage of the population remains unbanked. With mobile penetration considerably higher than banking penetration, MNOs have a unique economic relationship with subscribers that can be used to sell content. Delivering content, though, is a relatively small revenue opportunity. Revenue from value-added services, which include ringtones, ringback tones, wallpapers and other information-based services, across all emerging markets totalled only approximately US$11bn in 2011.[9]

As the movement towards consuming more varied and complex digital media takes off, fuelled by smartphone and mobile-broadband penetration, the MNO's position of strength becomes increasingly eroded. Mobile Internet has shifted the intelligence from the network, where connectivity is king, to the software and the device, where delivering content is critical – and where the manufacturers are better placed to improve the customer's experience. The increasing

**Figure 2: Mobile broadband connections to dominate Internet access in emerging economies by 2016**




Source: Bold and Davidson, "Mobile Broadband: Redefining Internet Access and Empowering Individuals," Global Information Technology Report 2012, World Economic Forum.

*Despite more than 10bn downloads of applications and more than a 50% share of the paid applications revenue globally, the Apple App Store is not a major profit centre.*

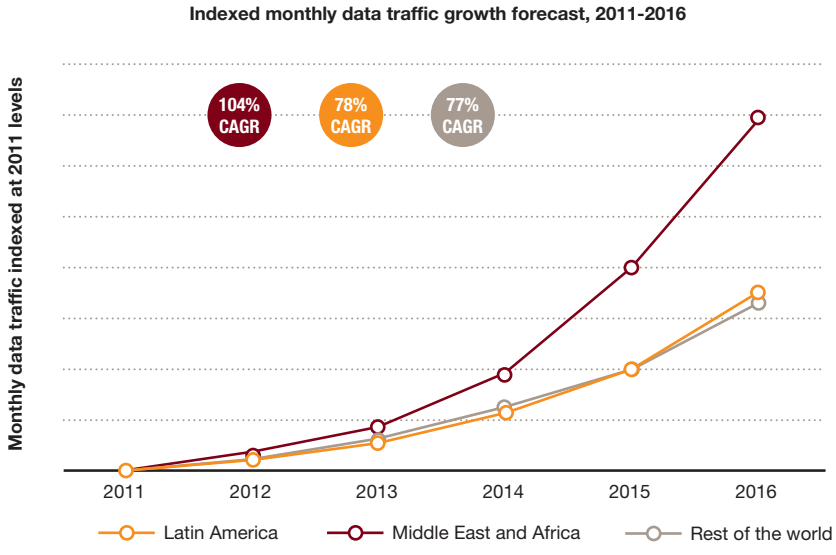
consumption of digital media puts pressure on pricing models and erodes the significance of an MNO's billing relationship. The business model of content developers will evolve from a simple, traditional point-of-sale purchase to a reliance on mobile advertising for the majority of revenue. So having direct contact with consumers when they're making payments is likely to diminish. Ultimately, MNOs risk becoming irrelevant as other players in the value chain become better placed to offer content to consumers.

A couple examples of how content delivery has evolved in developed markets offer lessons for emerging markets. For instance, online content is a mature market in the UK and two operators had ambitions of capturing the demand there but have since withdrawn partially or fully from the market. One operator planned to offer a branded applications store, compatible across most handsets. It promoted its own media services and third-party applications. However, the company closed the store just two years after opening it. The other operator has been gradually reducing the offerings in its store due to limited take-up caused by a lack of scale and content expertise.

Despite more than 10bn downloads of applications and more than a 50% share of the paid applications revenue globally, the Apple App Store is not a major profit centre. In 2012, Apple announced it had cumulative revenues since inception of approximately US$5.7bn and had paid US$4.0bn to developers, leaving a gross margin of US$1.7bn over four years. Given the running and development costs, it's no surprise that as Apple Chief Financial Officer Peter Oppenheimer admitted in 2011, "We run the App Store just a little over breakeven." Still, Apple represents one of the leaders in terms of monetising its offering.

In emerging markets, pricing pressures are likely to be even more acute. Lower disposable incomes, a high number of unbanked individuals, limited regulatory enforcement and piracy further undermine the opportunity to sell content to a large audience. The direct financial gains for the vendor of content are likely to be very limited.

**Figure 3: Data consumption in emerging markets is expected to grow very strongly**



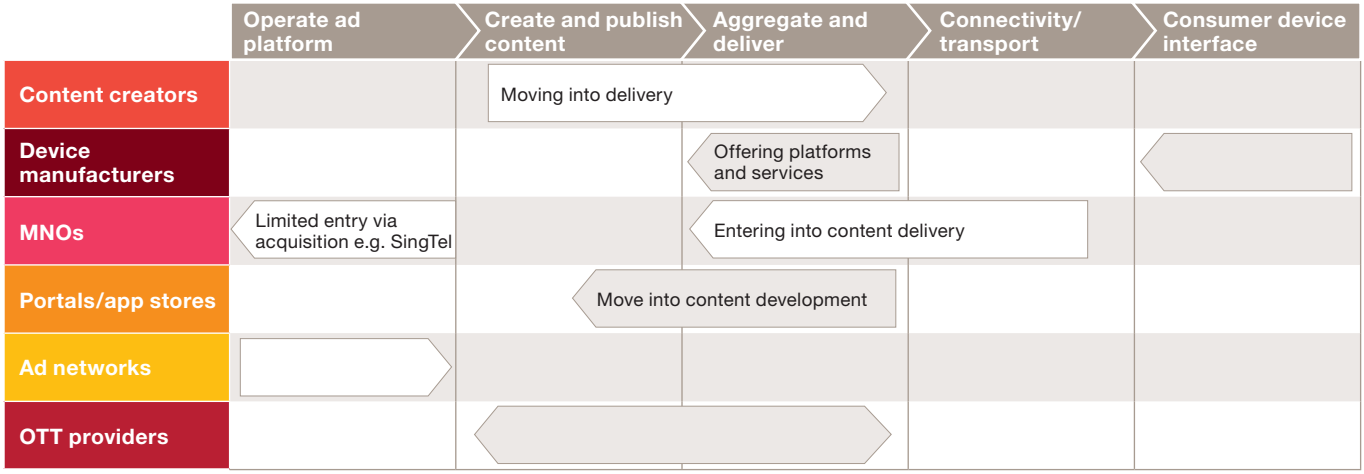

Source: Cisco, "Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2011-2016" (2012).

## A new content strategy and implications for emerging economies

This is not to suggest there is no position for MNOs in delivering content. What we're suggesting is that their primary focus for stimulating consumer demand should be elsewhere. For any content strategy an MNO undertakes, we see two critical considerations emerging:

**Content strategy must be flexible, and potentially reversible.** MNOs should understand that they'll cease to be the best-placed player to deliver content when delivery by SMS begins to fade and content through mobile broadband begins to dominate. So MNOs need to be prepared with a reversible strategy for delivering

**Figure 4: The mobile content value chain is becoming increasingly congested, particularly for aggregation and delivery[10]**




Source: PwC's analysis.

content to their subscribers. Content aggregation and delivery are obvious points of contact with consumers and will quickly become a congested segment (see Figure 4). MNOs need to think of their business model for delivering content to their customers as buy/partner/build.

**Content offering should have a specific theme.** The best hope for MNOs to retain a degree of relevance in content delivery is to have a specific niche or theme. Specialising in, for example, delivering local content can help maintain relevance and inspire brand affinity with specific social groups. Several operators either have signed deals with major music labels or have sponsored regional sporting events in order to offer exclusive content (e.g. Orange sponsored the African Cup of Nations in 2012 and offered SMS alerts and rich content to their customers).

## Moving elsewhere in the digital ecosystem

We see participating in mobile advertising as the best way for MNOs to strengthen their position in the wider value chain – and to stimulate growth of the digital ecosystem simultaneously. Particularly in emerging markets, given the pressure on pricing they experience, mobile advertising has huge potential to be an essential economic support to content. MNOs can stimulate the mobile advertising market by helping to provide the technical platform needed for content development and for growth through investing and sharing resources. Mobile advertising relies predominantly on the reach and depth of information about customers. So MNOs are much better placed to offer the core requirements – access to customer data, proximity to network equipment – than they are to deliver content. Mobile advertising may be another step removed from an MNO's core aim of increasing data revenues, but it's foundational to the viability of content. And it's more likely to offer a substantial stand-alone revenue opportunity too.

Let's explore the demand for mobile advertising – and our understanding of how MNOs should approach this opportunity.

The growth of disposable income is causing the middle class of emerging economies to expand at the same time that the youth segments of those populations – who represent an important target for advertisers – are expanding. These macro trends are drawing significant advertising investment as brands begin to target the opportunities these increasingly wealthy and connected societies offer. Even with global spending on advertising having grown at only 3%

*We see participating in mobile advertising as the best way for MNOs to strengthen their position in the wider value chain – and to stimulate growth of the digital ecosystem simultaneously.*

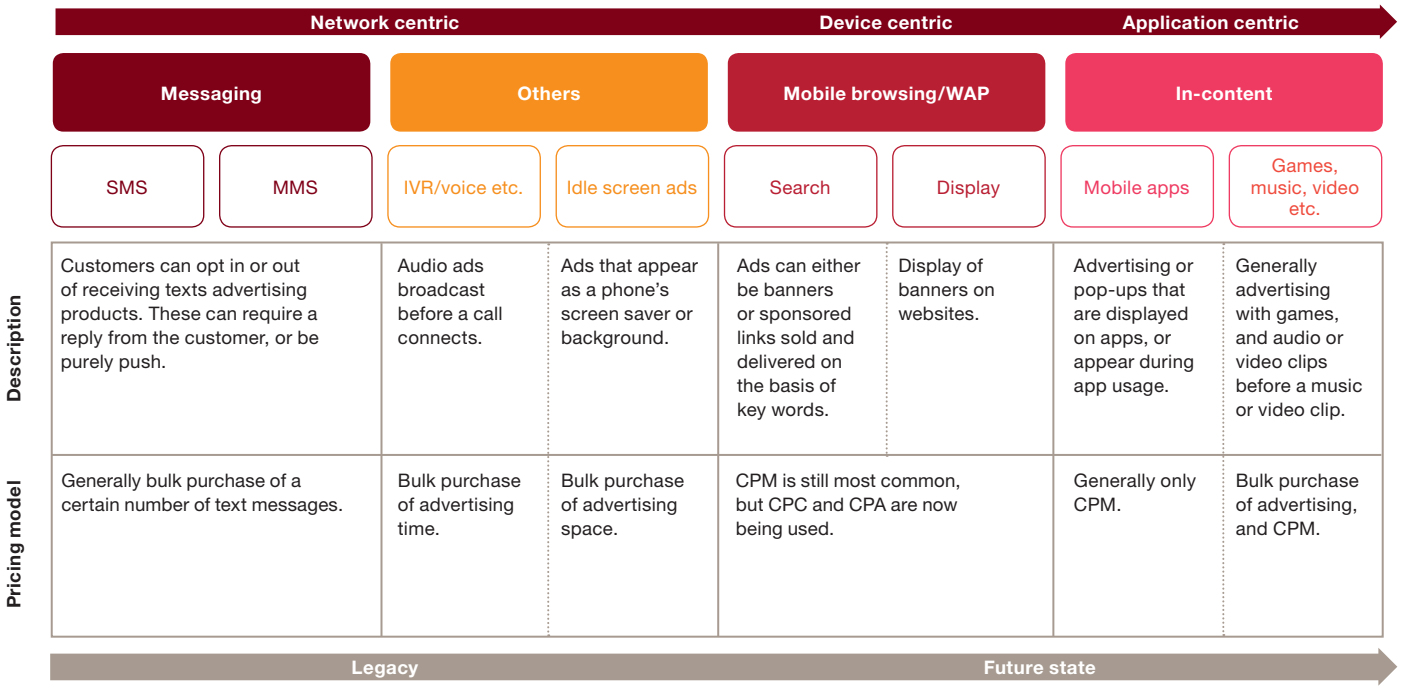
in 2011, it grew strongly in emerging markets. In Latin America advertising grew 9%, and in the Middle East and Africa it grew an impressive 23% year-on-year.[11]

Within this advertising boom, the rapidly increasing penetration of mobile devices is making the mobile channel a popular route to consumers. Mobile advertising revenues are expected to grow at an annual pace of around 65-70% until 2015 across Latin America, Africa and the Middle East.[12] Through 2011, the mobile ad network InMobi saw the number of ad impressions it served in Africa alone grow at almost 10% per month.[13]

In emerging economies where smartphone penetration (although growing quickly) is still quite low, MNOs should look initially at capitalising on their unique ability to dominate SMS advertising, which inherently centres on networks (see Figure 5). The SMS/MMS channel is a strong asset that an MNO can make good use of by developing targeted messaging campaigns. The MNO's knowledge of its customer base represents a strength it can monetise when advertisers want to target certain demographics. Vodacom in South Africa, for example, has had success predominantly through bulk SMS campaigns, and through more intelligent services that send ads to users who have opted-in to receive messages based on dialogue about their interests. The company lets the advertisers use Vodacom's customer database to run intelligent profiling and matches the customers' interests with relevant advertisers' messages.

The device and network evolution, though, will mean MNOs won't be able to rely on their strength in connectivity to maintain their position in advertising. The growing complexity of advertising through mobile broadband is a double-edged sword.

**Figure 5: The evolution of mobile advertising**




CPC = Cost per click CPM = Cost per 1,000 views CPA = Cost per (pre-agreed) action

Source: PwC's analysis.

**Figure 6: Examples of how global MNOs have positioned themselves to enter the mobile ad network market**

| Operator | Type of deal | Territory reach | Approach |
|---|---|---|---|
| SingTel | Acquisition | Global | Singapore-based operator SingTel announced in March 2012 it would buy Amobee to expand its mobile advertising business in a deal worth US$321m. Amobee, a mobile advertising company, owns an ad-serving platform that covers banner and rich-media ads. Amobee is serving 12bn monthly mobile ad impressions, 35m opt-in users on SMS/MMS and 18m daily messages. |
| Project Oscar | Partnership | UK (initially) | O2, Vodafone and EE created the Project Oscar partnership to achieve the scale necessary to offer a credible alternative to the online payments and advertising platforms the large Internet players have established. The major operators in the UK have partnered to generate the scale to develop an ad network that can offer advertisers the opportunity to reach the vast majority of mobile subscribers in the UK through one entity. |
| Orange | Acquisition | UK /Global | Orange France Telecom acquired the UK digital-marketing company Unanimis in August 2009 to develop its advertising business and offer new services. Unanimis sells advertising to media and advertising agencies and to direct advertisers that are looking to reach a relevant audience through the Internet and mobile. Since summer 2011, Orange integrated Unanimis into its Digital Media entity, under a single chief executive officer. |

Source: PwC's analysis based on companies' website information.

On one hand, mobile advertising will become increasingly centred on devices, and the complexity attached to physically delivering ads, recording their effectiveness and developing market-based pricing will require sophisticated platforms to push ads to customers. That, in turn, will draw advertising further away from MNOs' capabilities.

On the other hand, advertisers will expect the targeting of customers to improve based on the volume of consumer information that can be collected, and MNOs hold unique and valuable information about a customer's location, billing habits and so on. On top of this, in emerging markets, where airtime is at more of a premium than in developed economies, exchanging free minutes or data for accepting ads can bring MNOs back into the fold.

MNOs should consider how they can develop a strong offering in mobile-broadband advertising by either developing, acquiring or partnering with a mobile advertising network. The most appropriate approach will depend entirely on the size of an MNO's market and its competitive position, scale of operations and current capabilities. Figure 6 shows some examples of how several operators have approached this challenge.

## Understanding the right business model and the right approach

The challenge for MNOs is to understand the right business model for the economy they're operating in. We see three areas as essential for any mobile advertising platform to be effective for advertisers: (1) the depth and quality of consumer information that can be provided to advertisers, (2) the number of consumers accessible through the network and (3) the effectiveness of the software platform that delivers the ads.

When deciding how to play in this market, MNOs should focus on these three approaches and translate them into the main tasks they must get right:

1. **Analysing data.** MNOs need to make sure that their data on customers is usable and meaningful. To be able to give advertisers high-quality, real-time data – and to communicate the data's uniqueness (such as location information) to advertisers – MNOs must have data-analytics capabilities. The quality and the depth of data they receive ultimately dictate how well advertisers can target consumer groups and, in turn, the financial value of the ads. Both the complexity and the large volume of customer information make excelling in data analytics a real challenge.

2. **Reaching appropriate scale.** This approach will differ depending on each operator's specific circumstances. Those with significant market share may have the scale and reach suitable to make developing their own advertising network viable. For others to achieve the scale required for the proposition to be commercially viable, they'll need to either partner with other operators or ad networks or buy into established ad networks. Some operators want to have a 'closed' network, or to look at a broader, regional footprint as the market grows. Others will look for an open model. Understanding the criteria and when to choose the relevant model are critical for a strategy to succeed.

3. **Developing the platform.** This approach will consider various dimensions, such as technical, financial and regulatory. While most operators have the technical teams to undertake large information-technology or platform projects, they may not be ready to invest a large sum in an advertising platform. So the operators need to clearly assess the best options: make, buy or partner. And they'll need to evaluate risks related to customer privacy and local regulations, which will raise uncertainty and complexity.

In a time when traditional voice and SMS offerings are becoming commoditised services, PwC believes that mobile operators in emerging markets must define a pro-active strategy for digital media services and develop the right partnerships. By not taking action now, operators risk losing out on the promise of new data revenues.

## *Footnotes*

1 *O2* press release, "Making calls has become fifth most frequent use for a Smartphone for newly-networked generation of users," 29/06/12.

2 Qiang and Rossotto, with Kimura, "Economic Impacts of Broadband", in *Information and Communications for Development* (2009), World Bank.

3 *The Economist,* "Upwardly mobile", 25/08/12; International Telecommunications Union website (2012).

4 Bold and Davidson, "Mobile Broadband: Redefining Internet Access and Empowering Individuals", in *Global Information Technology Report 2012,* World Economic Forum.

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7 Ericsson ConsumerLab, *Emerging App Culture* (2012).

8 Ericsson ConsumerLab, *Emerging App Culture* (2012).

9 Ovum, "Big changes ahead for mobile content in emerging markets" (2012).

10 Based on analysis in World Economic Forum, "Digital Ecosystem Convergence between IT, Telecoms, Media and Entertainment" (2007).

11 Nielsen, "Global AdView Pulse Q1 2012."

12 Informa Telecoms & Media Mobile marketing report (07/06/2011).

13 InMobi network research publications (2011).

Row of bicycles, China.

# *Revenue assurance: where to from here?*

*The dynamic nature of the communications industry affects the role, responsibilities and priorities of every part of a telecom organisation, from network operations, information technology and finance to product development, customer care and human resources. Although often in the background, the revenue assurance (RA) group isn't exempt from the winds of change. In fact, RA is gaining renewed attention within many operators as a way to help increase revenues and capture value as products and services become more complex, markets mature and margin pressure increases. And the move towards a data-driven future means the RA function must realign itself to continue to be a valued asset within the organisation.*

**by Andrew Wheadon and Jesús Domínguez Colino**

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The authors wish to thank Laura Gebhardt, Juan A. Carmona, Rene Sieben, Antonio Tristán and Floriano Paulino for their contributions to this article.


Pedestrian overpass, Bangkok, Thailand.

Over the past 20 years, telecom operators have focused on increasing their revenue and their subscribers, and revenue leakage wasn't a top priority. As telecom markets in Europe, North and South America and parts of Asia are approaching saturation and facing tougher competition, operators are struggling to acquire new customers. In some cases, operators are targeting less affluent customers and offering more tightly calculated tariffs or riskier service bundles. This approach often has led to steadily decreasing prices (although partly offset by increased use) and, subsequently, to lower margins. That's because costs aren't decreasing at the same rate – a trend many analysts expect to continue.

As a consequence, operators will grow primarily by capturing market share from other players or by increasing their share of each customer's wallet. When customers find their experience lacking or find services and products poor compared to those of competitors, operators face the dangers of increased churn. What makes customers dissatisfied are incorrect bills (e.g. unjustified gains), delays in launching competitive new services and failures to successfully deliver such services.

Within this maturing environment, the industry is simultaneously undergoing a digital revolution and a mobile revolution. Telecom operators are having to offer more services and products as services continue to migrate to new digital and mobile technologies. The convergence of services across physical infrastructures (fixed, broadband, mobile, cable and other entertainment services) coupled with cross-platform bundles and the desire to charge depending on the types of services being used over data streams (e.g. through deep-packet inspection) add to the complexity.

Around the world, the adoption of smartphones and tablets has increased the use of mobile data, which has increased the need for more network capacity and higher speeds. Subsequently, capturing data usage for the purpose of ensuring caps, charging for add-ons or limiting throughput becomes ever more complicated and increases the likelihood for revenue leakages to occur.

Regulatory changes in all markets require that telecom operators adapt internal systems and controls to adhere to such developments. For example, in the European Union data-roaming charges are accepted only up to a certain monthly threshold. After that, the operator is responsible for deactivating data roaming for a specific client unless otherwise authorised. So, the operator needs to ensure the cut-off in a timely manner to avoid incurring unrecoverable roaming costs. In other

*Subsequently, capturing data usage for the purpose of ensuring caps, charging for add-ons or limiting throughput becomes ever more complicated and increases the likelihood for revenue leakages to occur.*

markets, the focus might be on changes in interconnection fees or activation taxes applied by the regulator.

Service offerings that include third-party content are more difficult to control than are traditional services (e.g. broadcasting services, music streaming and premium services). There's a need for the operator to capture all usage recorded by multiple systems, whether an operator's own or those of third-party partners – and often a number of partners may be involved. Different arrangements for commissions and payments exist, all of which need to be captured, applied, verified and reconciled across multiple internal systems.

That's where the revenue assurance function comes in. All these market challenges create opportunities for RA to help the organisation increase revenues and create value.

## Creating value in these times: roles revenue assurance can play

Traditionally, operators have seen the main value of the RA function to be recovering revenue leakage as a result of data analysis. Through these recoveries, operators often can increase their recognised revenues by 1% to 3%. But depending on the maturity of the business and the RA function, the value added by the RA function in this traditional sense likely will decrease as the biggest leakage areas are closed.

The maturity of an RA group can be measured across various dimensions, including governance, periodic-automated and semi-automated controls over revenue streams, tools used, new product development and skilled resources. The higher the maturity, the more automated controls have improved the quality of the business processes and the less revenue leakage will be identified. In this case, the role of RA within the organisation needs to become more strategic, and the role could be developed around the following areas:

**Cross-functional, deep understanding of the business.** Over time, the rotating of staff (internal and external), business processes that go undocumented or the functionality of legacy systems and the workarounds they require can cause a loss of knowledge. Lost knowledge can affect the functional, technical and commercial design of new products. Because it controls critical revenue streams and systems, the RA function can support other business areas. In doing so, it makes full use of its cross-functional understanding of the business and of the limitations and capabilities of processes and systems. For example, one operator detected a promotion where browsing by social networks wasn't being charged, and the network wasn't able to distinguish this type of traffic. A huge revenue leak resulted since none of that data traffic was being charged.

**Improved business performance.** Many times new products deliver a lower return on investment than expected because of poorly implemented business processes or poorly designed services. Some products even generate negative margins when they're launched commercially due to inherent design flaws resulting from a lack of understanding by the parties involved. Involving RA in the early stages of a product's life cycle can help an operator deliver reliable and sustainable services, reduce fault scenarios and improve the return on investment. Such was the case for one operator that wanted to design an international voice plan with an average rate for all countries. But RA found that in some countries, including Cuba, charges are much higher than average, and calls to the island certainly could lead to a huge loss of revenue.

**Cost assurance.** As margins tighten and as bundled offerings remove the one-to-one link between the cost of events that operators bill and the charges they actually apply, using RA controls on the factors that most influence costs becomes more important. Influences on costs include dealer incentives, handset subsidies, revenue sharing with third parties (i.e. premium SMS but also content and value-added services) and direct costs related to revenue streams (interconnection, roaming, etc.).

Many times in these areas, manual processes, complexity and rapidly evolving business rules imply the need for manual controls. But because they're time-consuming, the RA function can employ its expertise and tool sets to increase the effectiveness and automation levels of manual controls. For example, just as it models expected consumption patterns it can model revenue sharing. Or it can replicate the actual revenue-sharing agreements in the RA tools to revalidate the calculations and payments to expect.

## Finding the path to success: aligning RA within the organisation

We've shown why the RA function has gained attention and how it can bring value to the company beyond its traditional role. Now one question rises to the top: how can operators create a successful path for RA within the organisation?

Many RA departments start by securing sufficient resources to carry out their analysis. They need both hard and soft resources. Soft resources include training, governance, relationships with other departments and a clearly defined strategy for and competencies of the RA function. Hard resources include head count, available tools, various test-call generators and independent invoice-verification tools, business/systems knowledge and an experienced and skilled staff. The operator that makes sure the RA function has these resources is taking a critical step in improving the results and the value that RA gives the rest of the organisation.

Once the right resources are in place, the next step is to prioritise the new areas to analyse. Sometimes the RA function can lose its focus in day-to-day, repetitive controls, especially if it finds itself an integral part of keeping the operations running. Another challenge can occur when a lack of focus results in giving too much attention to areas with low risk or areas of low revenue contribution. Being perceived as not very valuable can damage the image of the RA function. For that reason but, more important, also for the benefit of the organisation, new RA opportunities must be prioritised properly and in a structured manner.

This prioritisation should take into account business inputs (i.e. contribution of the revenue stream to the whole revenues of the company), RA strategy (some areas are out of the scope of the RA function based on governance decisions), the number of controls (primary and secondary) applied to the revenue stream and knowledge of the revenue stream (sometimes a lack of knowledge on an issue can imply the need for a lengthy analysis). Priorities also should be set according to resources, skills and the availability and capability of tools to run the required analysis, among other factors.

It's also important for the rest of the business areas to share with the RA function insights about their strategy and road map for the short- and the mid-term. The RA function should use these insights to define its mid-term strategy and prioritise its next steps. Aligning the business, systems and RA function will improve output for all involved parties and will enhance results for the whole company. And it will enhance the value the RA function adds and recognition of RA's value by the rest of the business.

In securing this involvement, stakeholder engagement can be a source of help to RA. But what's most likely to get attention is a costly failure that causes other departments to rethink their attitudes towards the RA function. For example, a product launch may fail because only at a very late stage does it become apparent that the service can't be properly and reliably invoiced; or a significant revenue leakage may occur because RA wasn't adequately involved. Getting the other business areas to share insights isn't easy, but by proving itself to be useful to those areas, the RA function can help the process become natural.

Finally, governance of these matters is critical for them to succeed. That's especially true for a mature RA function, which often in evaluating new revenue assurance opportunities has to address how changes will affect various areas within the business. For example, customer care may benefit from an improved control, but sales or marketing may perceive it as a barrier to customers adopting the service. The RA function needs to help both departments understand the impact on revenue risk and what the costs would be of proceeding without improved controls.

In our experience, identifying the right persons to validate and sign off on the opportunities the RA function detects, and managing this process and all the stakeholders, is a great challenge. To overcome challenges, RA often has to engage with stakeholders whose personal targets will be affected by the proposed RA controls. The chief executive officer and the customer service and billing departments are more likely to be supportive than is a mid-level marketing manager whose goals aren't linked to either profitability or cost-efficient services.

## Understanding the future to come

Long Term Evolution is the newest mobile communications standard currently being deployed. With it come significant increases in access network speed and capacity as well as new complexities regarding spectrum and coverage. It's also giving birth to the so-called 4th generation (4G) devices, products and services. Not simply a minor upgrade, this radio standard also aims to improve the whole network architecture by simplifying it and reducing latency. The resulting network follows an all-IP paradigm, which means it will behave like a classic Internet network, but for mobile access.

These changes in the network will affect the way operators work and sell, forcing them to move to an evolved, data-based model. The main conceptual difference is that value will be in the access and application sides – quite similar to the Internet.

## *Revenue assurance: what it can do for operators*

The revenue assurance (RA) function within a telecommunications operator helps make sure that the services and products sold are charged (or credited, as the case may be) accurately, completely and on a timely basis to customers and business partners.

An important responsibility of the RA function is to find and address revenue leaks and unjustified gains. Leaks and gains can be found across all revenue streams of a telecom operator. They occur in post-paid, pre-paid, wholesale, interconnection and roaming. And a typical operator in an established market has, according to industry estimates, between 1% ands 3% of its revenue at risk.

The RA function that's successful in identifying revenue leaks takes the essential step of engaging all the departments. That gives RA an end-to-end view of the various revenue streams and the risks associated with them. Operating with a cross-functional understanding of the business and all its systems, the RA function becomes a valuable asset to the whole organisation.

Kappelbrücke, Lucerne, Switzerland.

*Aligning the business, systems and RA function will improve output for all involved parties and will enhance results for the whole company. And it will enhance the value the RA function adds and recognition of RA's value by the rest of the business.*

As for the RA function, its traditional role of assuring customer billing may become less crucial as billing shifts more and more to monthly fees rather than usage. Other important changes will affect voice calls. They'll need to be re-engineered to be treated like data or, potentially, as a specific type of data charged at flat rates (similar to many of today's fixed offerings). Billing will accelerate its shift to online, real-time information. Even the concept of mediation, prone to errors, is being questioned in light of the simplification of the network and the falling costs of storage and processing power.

The batch-driven RA tools have been around for some time. So the new mobile generation definitely will incorporate some major transformation projects for operators worldwide as they evolve to compete in this scenario. Many operators, though, already understand these changes and are preparing themselves for the future, which is near.

For those who aren't sufficiently challenged by these changes, new industries are opening vast new fields for RA expertise. Namely, the energy market, which is introducing smart metres, real-time rating, intelligent devices, consumption-dependent dynamic tariff models and value-added services (energy management). All the new products and services create the need to set up new RA functions to deal with the inherent challenges – provisioning, activating and rating.

We find a similar example in the automotive industry, where original equipment manufacturers are deploying next-generation in-car/near-car services and augmented information for drivers. These new products include the known areas of revenue leakage related to generating events and providing services. And they have completely new challenges related to the tariff and invoice complexities of multi-user corporate and private service consumption (e.g. using a toll road in a corporate vehicle outside working hours or sharing corporate vehicles on weekends).

To be able to play an important role in the future, an RA function needs to understand these changes and their implications on the business and to develop its role within an operator. It will have to decide whether to keep its – significantly reduced – traditional role or to evolve into a broader one. In the latter case, it would focus on reducing costs and helping the business define better business rules for access policies, product strategies and network effectiveness and margins.

Whichever path it chooses, the RA function remains a valuable part of the business. As one of the few functions that deeply understands and retains cross-functional, end-to-end knowledge, revenue assurance is an asset many operators will refuse to lose.


Times Square, New York, USA.

# *Perspectives*

*Going further. Pushing the limits. Striving for more. It takes great leaders to help companies identify and implement the changes to get there – and to have the courage to lead their companies in new directions.*

*Here, we give industry leaders an opportunity to share perspectives on their journey.*

*An interview with:*

# Fran Shammo
# Verizon

*Since the late 1990s the US telecommunications market has undergone rapid and dramatic changes. Long gone are the days of the Baby Bells with regional territories. Regulation, innovation, consolidation, competition and technology all have reshaped the industry, and Verizon Communications is among the few operators that have managed to come out on top. Critical to its success has been the ability for the operator to evolve, to anticipate trends and to make big bets. In late 2012, we chatted with Verizon's Chief Financial Officer Fran Shammo – who has been integral in Verizon's evolution – about the company's commitment to building long-term shareholder value by focusing on platforms, product innovation and people.*

Fran Shammo is executive vice president and chief financial officer for Verizon Communications, responsible for the company's finance and strategic planning operations and financial transaction services.

Before being appointed to his position in 2010, he was president and chief executive officer of Verizon Telecom and Business, responsible for sales, marketing and customer service excellence for the company's consumer, small-business, enterprise and wholesale customers worldwide. Previously, Fran was president of Verizon Business, and prior to that appointment he served as senior vice president and chief financial officer for Verizon Business.

Fran has also served as president-West area for Verizon Wireless, responsible for the company's operations in 13 states. He was vice president and controller at the time of Verizon Wireless' launch, and was responsible for formulating and implementing its financial processes, as well as leading Sarbanes-Oxley compliance and reporting requirements.

Fran is a member of the Philadelphia University Board of Trustees. He also served as a member of the Board of Micrus Endovascular Corporation and was chairman of its audit committee, before the company was acquired by Johnson & Johnson in 2010.

He holds a bachelor's degree in accounting from Philadelphia University and a master's degree in business administration from La Salle University, and he's a Certified Public Accountant.

For more information, visit the company's website at www.verizon.com.

**Communications Review:** Verizon's network is built on four pillars: mobile, fibre to the home, cloud and the global backbone. The company has invested billions of dollars in these networks over the past decade. The capex requirements for maintenance and innovation will always be there. So, how are you going to monetise these networks to maximise Verizon's return on capital invested? Where do you see the most opportunity?

**Shammo:** When Lowell McAdam became CEO of Verizon 18 months ago, his first priority was to focus on long-term shareholder value. We had everyone in the business go through training to understand what that concept means for Verizon, how it impacts our operations, our decisions, everything. We then needed to identify how to continue to build that value because there's a lot to consider. We're a huge investor – US$16bn annually. So, we had to decide where to place our bets.

Return on invested capital [ROIC] is getting a lot more focus now than in the past. We look at ROIC not only from a business unit perspective, but also from the perspective of each individual product. We've developed metrics for return on individual products and, as a result, we're now going through a product rationalisation exercise. We're doing away with a lot of products that are not profitable; they don't return their invested capital, so we just have to stop selling them.

Once you get through that type of analysis and exercise, you can begin to place your bets. Where? Let's start with wireless. We were the first to pioneer the most advanced LTE network in the world. Sometimes you have to take the risk and place the bet in the direction you know you need to take. We made the investment in LTE when others just stood back and said, "Well, there is no ecosystem there; we're not sure how it will work; we'll wait and see." But what happened is that over an 18-month period that ecosystem evolved from 3G to LTE. We had already started to build out the LTE network, and now we have a significant competitive advantage because of it.

In wireless, our focus is twofold. One, we want to continue to grow the LTE network and drive return around that network. We want to drive data on that network because it's more efficient than 3G, and we want to develop all innovation on that network. Two, at the same time, we've invested a lot in our 3G network and need to continue to get value from it. So when capacity frees up, we have an opportunity to develop more aggressive offers around niches that we haven't played in before – for example, the prepaid market. We continue to look for ways to get value from that 3G network and create more return on that fixed cost.

On the consumer side, with wireline, we made the bet seven years ago to invest in fibre. Today, around two-thirds of our residential revenue is generated by FiOS [Verizon's fibre offering of voice, data and TV services]. Our strategy is to leverage that platform and its market-leading speed and capacity. With a small, incremental investment, we can get an even greater return on that network, especially if we look beyond traditional applications for consumer TV, data and voice.

The strategy for us now is to determine what platforms we want to take us into the future. LTE is one. Fibre is another. In the enterprise market, there are three assets that create the platform: the Terremark asset for cloud; Hughes Telematics for M2M [machine-to-machine]; and our security offerings. Underlying it all, of course, is the core network upon which we've built our brand. So, key to our investment strategy is to continue to build our reputation around being the best, most reliable network out there among our competitors. Everything we do is based on that foundation.

**Communications Review:** In terms of allocating capital for the short-term vs. the long-term, you're probably going to have to invest in creating new products to replace the old products that still run on the copper network. A balance is needed – investing in the short term to help deliver the long-term value. How do you find that equilibrium?

**Shammo:** This issue is currently front and centre as we deal with the impact of Hurricane Sandy in lower Manhattan. The storm destroyed our copper network there. Salt water and copper don't mix. And, obviously, we want to rebuild using fibre. Customers have requirements that we need to recreate on fibre, and the challenge becomes how to replicate that in a standardised fashion so we're not customising every product. We're focused on creating standardisation across that affected footprint to increase the returns on invested capital rather than on creating customised products that offer lesser returns.

We also lost copper network on the barrier islands in New Jersey. The question there is, does it make sense to install fibre or to come in with an LTE overlay? We'd like to offer customers something different than a traditional copper network, because the long-term value to customers, and our own long-term return, won't come from copper. In all of this rebuilding, we also have to balance the regulatory aspect. We believe there are ways to satisfy the regulatory requirements and deliver a better return on our investment and better products to our customers.

**Communications Review:** Growth will come from new revenue streams as well as new cost structures of the business as you focus on your main platforms. Around the world, we're seeing operators decommission older networks as they invest in new technologies to deliver new services. This is a complicated process, involving both business and technology issues. What are your thoughts on this?

**Shammo:** We focused on topline growth in 2012, and we established a nice progression. Now we're more disciplined, and we have to start to improve the margin and get the cost

*What's important is that we've created a pipeline of innovation. In the process, we've learned that partnerships and alliances are critical because there's no way that we by ourselves can develop the software and the devices to ride over these networks.*

structure right. It's not just cut, cut, cut. There are more efficient ways to do business that will inherently take out costs so you become more productive. We have to focus on efficiency and productivity.

From a cost structure, the best thing that we can do is to continue to migrate copper customers to fibre. However, the decommissioning issue varies by business, since solutions for enterprise and for consumer customers can be very different. Not all copper is the same, so some customers are fine staying where they are. On the enterprise side, it's more difficult because you need new solutions to take to customers to show them how they will benefit on the new platform. This takes time but in the future will help drive the ROIC.

**Communications Review:** When we talk about investing in new platforms, a correlative aspect is the impact on your operating model. How do you make sure the operating model keeps up with the innovation that you have to create to deliver value to customers and shareholders?

**Shammo:** There are a couple of considerations. For one, how do you develop innovation within the company to continue to innovate those platforms? We built our Innovation Center in Waltham, Massachusetts, two years ago, and we're excited by what has been developed there. Some of this innovation will come into play next year; some will come five years from now. What's important is that we've created a pipeline of innovation. In the process, we've learned that partnerships and alliances are critical because there's no way that we by ourselves can develop the software and the devices to ride over these networks. Others are going to do that. We need to bring them into the fold, and that's what Waltham does.

Another consideration is pricing. In wireless, we changed the pricing to be more customer-friendly after seeing what happened outside the US with text messaging and voice, as voice was becoming more or less a commodity. We had to consider how to monetise that and give customers what they really want, which is data. So, we created a shared pricing plan across multiple devices. We feel that pricing is another way we can continue to grow our portfolio. This pricing change was significantly different for the US industry; we hadn't changed prices like that in maybe ten years.

The third component is to be sure that you can widen the target markets you go after. We're doing this by developing vertical applications. We know that healthcare is a big, big piece of the pie, and we need to make sure we capture that opportunity by offering innovative solutions. This is where Waltham comes back in play, and we've developed home healthcare monitoring and other services. Of course, there are significant challenges we need to work through here, too, such as HIPAA [Health Insurance Portability and Accountability Act] compliance, consumer privacy and data protection. So, you have to look at how to keep things moving ahead to support your vision and growth, and understand the pillars of core competency that you need in order to get there.

**Communications Review:** The Innovation Center is exciting. How do you monetise that? The company brings the innovation, which drives usage – which drives business. How will these innovations play out as parts of the business – through private equity stakes or joint ventures or acquisitions? How do you decide what to do?

**Shammo:** In our strategy group, we have an incubation programme that makes equity investments in companies we feel are developing something promising. It may be three to four years before a company takes off, but we want to be sure – if it's successful – that it runs on our platform and that we can convert that to a monetisation model.

Alliances and partnerships take many forms. They can be a revenue share or a JV scenario. We have done them all. With SpectrumCo, for example, we entered into a commercial agreement with the cable companies. Part of that agreement is to jointly develop innovation that can be used inside the home and also capture the wireless product. SpectrumCo is equally owned by the cable companies and us, and it's an interesting arrangement to be working with your competitors. But that's the way the industry is going. Look at ISIS, our mobile commerce joint venture with AT&T and T-Mobile.

As far as acquisitions, we've acquired Terremark, CloudSwitch and Hughes Telematics, among others.

Each of these models is significant. Have they all been successful? No. There are cultural issues that incumbents like us face; that's a fact. But we're learning to adapt, and we're maturing to find ways for partnerships to work. We have to.

**Communications Review:** Yes, there is a range of success in this industry with partnerships. What are the attributes of a successful partnership with a company like Verizon? What do you think creates the differences between a successful and an unsuccessful partnership?

**Shammo:** What makes a successful partnership is when both partners enter with an open mind to let things go. Most of our partnerships are in the enterprise space, and what has been hard is that everyone wants to encroach because enterprise touches many areas of the business. Take security, as an example. All companies have experience and all think they're great at it and want to use their portfolio. People can't agree, and the partnership falls apart.

To be successful, you need to bring to the table things that you can mesh together, and then everybody wins. I've seen this work well in the wireless business. You're not creating the friction of who is going to sell what and who is better than whom. I think this is critical. If you are going to sit at the table, you need to have an open mind that considers that you may have to give up some things to make the bigger pie better. It's not easy, especially for big companies to come to the table and acknowledge they're not as good at something as they thought they were.

We also have learned through our partnerships in SpectrumCo and Redbox [Verizon's video-on-demand offering] that you need to appoint a leader who's accountable for the new entity. We have done that for both organisations, and the leaders know that they're responsible for making the ventures successful. The rest of the organisation needs to focus on what they're currently responsible for and not pay attention to the partners. Rather than trying to absorb the partnership into the whole business unit, we need to let them remain independent.

**Communications Review:** You mentioned privacy and security earlier. Incumbent operators have a reputation as a safe haven for security and privacy vis à vis the over-the-top providers. As you start thinking about monetising data, privacy and security are big issues. Do you think there's real potential for this, or do you think the regulatory wall will be so high that you won't be able to get a decent return on products?

**Shammo:** I think we and the regulators feel the same about our customers' data security and privacy. We're on the same page. We take it very seriously. However, we do have a lot of data that's valuable to a lot of people. The question becomes how to accumulate the data to monetise it without compromising the security of the data or the privacy of the individual user.

One option for consumers is an opt-in scenario. If you walk into a large, national retail outlet, for example, and you want it to know every purchase you have made there before, you opt in to share that information. Then once you are in the store you're communicating with the retailer directly over our network, and the retailer can make whatever offers to you based on the information you've chosen to share. It's a good model; there's value to the retailer, to the consumer and to us. We don't think that the opt-out model – where you're automatically in unless you choose not to be – is a good model in this scenario.

We're seeing a fundamental shift from a generational perspective in this regard. The younger generation has a different perspective on privacy than its parents do. So, the younger population will tend to opt in more than older generations will.

Another option for monetising data has to do with the data that carriers have on various consumer habits. Carriers can aggregate data and not have any individual connected to that data, and then group the data in a way that provides value to different industries. This can be monetised without compromising privacy or individual security.

So, I think there are models that will work. We're at the beginning stages of working with this, and there will be hurdles along the way. But I think that we'll get to a place where these models are acceptable. Our view of the level of security and privacy commensurate with these types of offerings is aligned with that of our regulators. This is what people rely on us for. We have the brand we do because we protect the consumer's privacy, and we have to make sure that continues into the future because just one incident can be damaging to our reputation.

**Communications Review:** Let's talk about talent. The culture within and skills needed by an operator today are quite different from those of a telecommunications operator ten years ago. What are you doing to manage your talent pool, attract new hires and cultivate innovation within the company?

**Shammo:** You have to know your limits. It is very unlikely that a highly innovative entrepreneur is going to come to an organisation like ours and survive. It's night and day. It has always been that way.

For us, it begins with educating the people we have on long-term shareholder value. We spent the last two years helping people understand a dollar investment and why we invest and what the return means. You need to help your people transform if you want them to grow with you.

*Even in wireless, a company in a relatively young industry, you can see that the Six Sigma tool sets are helping people be more productive.*

We also started a lean Six Sigma programme about 12 months ago, and it has been opening eyes to the fact that we don't need to do things the way we have been doing them for the last 50 years. There are new ways to do things, and we are giving our people the tools to look at the world differently. Even in wireless, a company in a relatively young industry, you can see that the Six Sigma tool sets are helping people be more productive. I'm a true believer that you have to start internally by developing your current resources.

Now history shows that 30-40% of the people will fall out of that model because they just can't operate in a new way. So that gets to the second aspect: How do you attract the right people to your company who are going to fit well and who are going to help transform you to the next stage? That is a very difficult thing to do.

In finance, we found that we need to engage new recruits when they are midway through college. We spend the time to develop them during their internships and then ultimately hire them. During the internships, we show them how they can progress through the company. We're just starting to get our first recruits from this two-year effort, and it's likely that they will stay – they like us, and we like them. The people who didn't fit have already fallen out over the two years because they didn't like the model. We give the recruits rotational assignments, and they can see where they'll be in three years. This is very different than how things were done in the past, but it's what you need to deliver to the younger generation. If you don't, they're gone. It's critical for us to execute on this because in four to five years, these recruits will be the new leaders who come up through the ranks.

Finally, we have brought in fresh, external leadership talent with broader experience. Do they struggle? Yes, but at that level they know that they can bring something to the table, and we do, too – so we mature together.

**Communications Review:** Verizon has a solid brand in the US and has expanded rapidly through mergers and acquisitions over the years. There are still mergers in the US market, especially in wireless, that will continue to fuel competition in the industry. Given the landscape, does international expansion play a role in Verizon's future?

**Shammo:** It comes back to the strategic platforms. If you look at Hughes Telematics, that platform can be used anywhere in the world to deliver machine-to-machine communications. Same with Terremark and the cloud structure, where the assets can be global today; it can operate anywhere, to anyone. Expanding internationally for us doesn't mean laying fibre in other countries. It means taking these quality platforms and diversifying them to deliver solutions to anyone around the world.

I have been very public about my opinions on consolidation in the industry. I support it, and I think we need it. At the same time, at Verizon we have our strategy, and we need to execute on it and not be distracted by what others do. I think this mantra has served us well. I don't worry about consolidation; I think it's a good thing. My view is that when you have stronger players in the industry it's a tide that raises all boats. When you have more innovation, it expands the marketplace – and that's good for all carriers. We have our strategy, we know what our competitive advantages are and we need to capitalise them.

*The following publications, authored by partners at PwC, provide thought-provoking and informative discussions of interest to various segments of the industry. To obtain PDF files or hard copies of the publications, please visit the websites listed below.*

### Mobile innovations forecast

Where will the disruptions in mobile innovation arise over the next five years? How will they change consumer and employee behaviour? What business opportunities will result? What can companies do to take advantage of these disruptions? How do they fit into broader market trends now driving the technology sector? Answering these kinds of questions requires not just a keen understanding of the evolutionary curve of the enabling technologies, but a broader framework for analysing mobile innovation quantitatively and qualitatively. With the goal of providing business leaders early warnings about coming disruptions and actionable intelligence about new opportunities, PwC introduces its Mobile Innovations Forecast (MIF), a four-part framework for analysing and understanding mobile innovation. The four parts are: enabling technologies; new technological capabilities; new use cases; and new business models. To read more or download the PDF files, please visit www.pwc.com/mobileinnovations.

### Technology forecast: Solving business problems with game-based design (2012, issue 3)

What is it about games that we love so much? Whether it's the engagement, the motivation, or the challenge, businesses have taken notice. Solving business problems with game-based design, the new issue of the *Technology Forecast,* explores the wide range of game design techniques that can be used in non-game environments for business benefit, including motivating customers and employees and raising their levels of engagement. To read or download the PDF file, please visit www.pwc.com/techforecast.

### Global entertainment and media outlook: 2012-2016

PwC's *Global Entertainment and Media Outlook* is a comprehensive online source of global analysis and 5-year forecasts for consumer and advertising spending in 13 media segments across 48 countries. This year's *Outlook* focuses on 'the end of the digital beginning' as E&M companies reshape and retool for life in the 'new normal'. We discuss three perspectives around which we believe successful players will reshape their business: 1) understanding the connected consumer through data analytics while heeding concerns over privacy; 2) devising new business models to reinvent the value proposition of advertising and content; and 3) developing the organizational models and collaborative capabilities to drive revenues from new behaviours. For more information, visit www.pwc.com/outlook.

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Code: CRV17N3