Communications Review

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New frontiers

Cover image: Glider in flight, view from cockpit.

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Message from the Editor

In communications service offerings and marketplaces across the world, operators are facing an increasingly urgent need to move beyond their traditional boundaries in every sense—breaking new ground in terms of services, technologies, skill sets, organisational structures, workplace behaviours, corporate culture and social impacts. In essence, they are facing new frontiers.

Each of the pieces in our latest issue approaches this pervasive theme from a different angle, starting with an article on the strategic challenges and imperatives facing the communications industry going forward; moving through a series of five interviews with key stakeholders who are driving and enabling the industry to cross new frontiers in society at large. In bringing together this collection of interviews, we too have crossed new frontiers for *Communications Review*, focusing less on how we in the industry perceive success, and more on how others see us in the context of our broader contribution to society.

In our feature article, "Put to the Test", we examine the strategic changes operators need to make, and the new frontiers they must tackle both within and outside their organisations, if they are to grow revenues and shareholder value. While operators have shown admirable resilience during the economic crisis, I believe the industry now faces a far sterner test. To avoid a permanent reduction in their growth rates and margins, operators must move quickly to address six key challenges. This will require adopting modes of thinking, areas of focus and organisational approaches that are all very different from the past. Operators that achieve these changes successfully will turn digital transformation to their advantage, and win the battle for value. They will do this by re-establishing the value of connectivity, building stronger relationships with customers and collaborators, and using innovation to harness new revenue streams.

Having laid out our industry landscape and a roadmap for the future in the first article, we then move on to our Perspectives section. Each of the interviews is with a representative of a sector or social agenda that will be changed dramatically by communications. As well as presenting commercial risks and possibilities, our interviewees can see opportunities for communications companies to create and deliver a new level of value not just to their shareholders, but also to society as a whole—by improving the lives and wellbeing of countless millions of people across the world.

We begin with Jyrki Pulkkinen, CEO of the Global e-Schools and Community Initiative (GeSCI), founded by the United Nations in 2003. There is no doubt

that telecommunications services can support dramatic improvements in educational attainment, especially in developing countries with previously limited access to education. However, as Jyrki points out, there are always questions to be answered about how, when and where these benefits can actually be delivered. Interestingly, Jyrki stresses GeSCI's strong interest in developing innovations through knowledge partnerships with the private sector.

Our second interview is with another leader focused on the communications industry's potential to make a positive difference to society: Casey Harrell, who heads Greenpeace International's efforts within the ICT sectors. In a wide-ranging interview, he sorts operators' impacts into three baskets: first, within their own company footprint; second, the efficiency of the products and services they offer; and third, the embedded energy in the supply chain, from raw materials to manufacture and assembly. There is potential for improvement in each basket. However, in Casey's view, one of the biggest obstacles to success is not in taking action, but in getting industry players to cooperate with each other.

Our third interview is with Dr. Hamadoun Touré, Secretary-General of the International Telecommunication Union (ITU). The ITU's mission is to support and facilitate the growth and development of telecommunications and information networks, and to help people everywhere participate in the information society. A theme running through this interview is the power of collaboration, reflecting Dr. Touré's view that working together is the best way to achieve real progress. He is optimistic that the deployment of broadband networks will be a winner for everyone—including governments, consumers, operators, manufacturers and software developers.

Next we speak to Jean-François Cazenave, co-founder and president of Télécoms Sans Frontières (TSF). Jean-François describes how he was prompted to set up Télécoms Sans Frontières in the 1990s by the experiences of a number of crises in Kurdistan, Bosnia, Croatia, Iraq, and Peru which confirmed time and again that people in horrific situations needed to communicate. TSF enables them to do this, spending around €2 to €3 million a year on its missions, and working with supplier partners including Vizada, AT&T and Inmarsat, who donate equipment for use on TSF's projects.

Finally, we interview Dr. Najeeb Al-Shorbaji, the director of knowledge management and sharing at the World Health Organization (WHO). Dr. Al-Shorbaji defines eHealth as the umbrella term for applications such as telemedicine and telehealth, within which mobile health (m-health) is one application. As he points out, m-health is only gradually reaching remote or rural areas, with many projects being pilots or short of funds. Looking forward, Dr. Al-Shorbaji believes that private sector companies and shareholders have a 'collective responsibility' to help drive eHealth forward, in partnership with governments.

As successful businesses focused on generating shareholder value in the communications space, I believe we all share the responsibility to society at large. The frontiers we are facing are not only new, but wider in every sense—socially, geographically, economically and technologically. Having read the articles and interviews in this issue, I am sure the industry has the collective vision and commitment needed to fulfil its responsibilities, while also creating value for shareholders in the process.

As ever, I am eager to receive your suggestions and feedback. Please send any comments to me at colin.brereton@uk.pwc.com, or feel free to call me on [44] (0) 20 7213 3723.

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Partner
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Two men kayaking down the Savage River,
Western Maryland, USA

Put to the test

Communications operators have demonstrated their resilience amidst the recent turmoil by adapting successfully to pervasive change and simultaneously laying down a solid base from which to capitalise on the recovery. The real test, though, is just beginning, as the upturn gathers pace.

With broadband becoming ubiquitous and the growth of data services exploding, the telecom value chain is fragmenting rapidly. In the race to capture revenues, many operators are losing out to application, content and device providers, who are garnering the lion's share of new value. Facing saturation and commoditisation of their traditional core services, communications companies are at risk of permanently slower growth and narrower margins. In PricewaterhouseCoopers' view, operators—if they are to claim their rightful share of future value in the digital era—need to tackle six key strategic challenges.

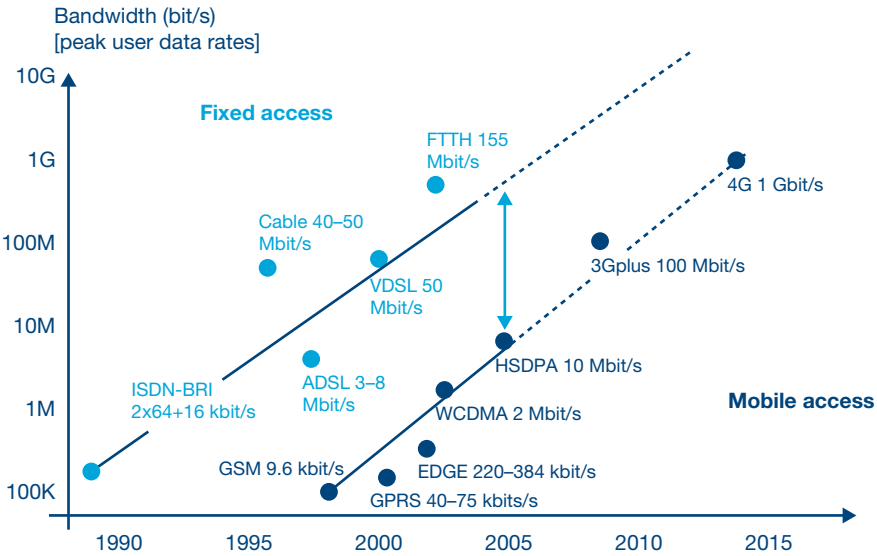
by Colin Brereton

The communications industry has emerged from the recent downturn in relatively good financial shape but facing a business environment that is undergoing a profound and irreversible transformation. The pace of innovation in the sector is continuing to accelerate in both fixed and mobile (*see Figure 1*), driving bandwidths ever higher. With each technological step forward, operators face an exponential rise in the data traffic being carried across their networks—and a corresponding decrease in the price they can effectively charge customers for carrying each bit of data.

As well as advancing, communications technologies—and the markets—they serve are converging at a headlong pace. This process is replacing the traditional telecom model with a convergence of network-centric, digital services.

Examples are evident across the industry worldwide. The smartphone is beginning to rival the personal computer as a communication tool, and consumers routinely use it to view digital content such as music, games and the Internet. This capability, coupled with the dramatic rise of social networking, has fundamentally changed mobile communications and is accelerating the migration to digital by providing anytime, anywhere access to digital content. At the same time, operators' previously core voice products are suffering from intensifying competition and market saturation. Both factors are driving revenues and margins downward in developed markets (*see Figure 2*), initially, and will have the same impact in emerging markets ultimately.

Figure 1: Successive technological advances driving fixed and mobile bandwidths ever higher



Sources: SwissCom, PricewaterhouseCoopers' analysis

Figure 2: Aggregate EBITDA margin for core voice services (mobile)

	2003	2009	% Change
UK	35.2%	23.7%	-11.5
Spain	48.1%	38.7%	-9.4
France	39.1%	35.7%	-3.4
Australia	41.6%	31.4%	-10.2
China	52.7%	45.9%	-6.8
India	33.3%	29.5%	-3.8
Latin America	36.4%	39.0%	2.6
Algeria	47.7%	54.6%	6.9
Egypt	60.2%	47.2%	-13.0
Morocco	46.4%	58.3%	11.9
Nigeria	50.1%	55.5%	5.4
South Africa	38.3%	41.0%	2.7

Source: PricewaterhouseCoopers' analysis

To date, communications companies have been quite successful in tackling the immediate financial pressures of the downturn. They have cut back operating costs, capital expenditure and debt and have put managing cash and improving the customer experience at the top of the management agenda. However, many still need to take steps to address the wider and longer-term challenges raised by digital transformation. Competing purely on (initially) network reach and (then) price would simply drive operators towards the role of a 'commoditised pipe'—and to surviving on a sliver of the value generated by data traffic and the revenues of other players.

To claim their place in the digital future, and ensure their share of digital revenues, operators need to raise their sights from simply providing services and generating cash to targeting the key strategic challenges facing them today and into the future. In broad terms, this shift will mean embedding customer centricity as a way to optimise their customer mix and offerings; securing revenues from elsewhere in the value chain; and aligning their operating models with the new market realities.

Shifting from volume to value

To maximise the impact of making those changes and reap the full benefits, operators will need to migrate from their traditional focus on volumes of call minutes and customers to a rigorous focus on value on each side of the customer relationship: the value delivered to each customer via a differentiated, tailored experience, and the value gleaned from each customer for the operator itself. Operators embarking on this migration from volume to value have a number of assets at their disposal.

Although networks and billing may seem far from 'sexy', they actually are the main weapon in operators' value-creating arsenal, since their networks are pivotal to the success of other participants in the value chain and help them maintain ongoing customer relationships. Furthermore, a number of approaches have already emerged to help operators drive their nontraditional revenues upwards, such as offering multi-play bundles that include TV content and expanding their role as business-to-business service providers.

As operators strive to reposition themselves to capture their fair share of digital value, we believe they will need to tackle six critical strategic challenges, which we examine below.

Strategic challenge 1: Establishing ownership and understanding of the customer

As a succession of new players—ranging from device manufacturers to application developers, and from content suppliers to retail brands—enter the communications marketplace, it is becoming increasingly difficult for any one entity to claim ownership of the end customer. The effect on operators has been compounded by a change in recent years in the focus of customers' loyalty and brand trust, which have shifted away from the network on which devices and services operate and have migrated towards the device itself and the online applications accessed through it.

This shift has been engineered partly by device, content and service providers, who have proved adept at cementing their brands into the public consciousness and at playing operators against one another. They also have demonstrated impressive agility and responsiveness in identifying customers' changing needs and behaviours, and in innovating or stimulating innovation by third parties—such as mobile applications developers—to meet them.

Six key strategic challenges for communications operators

1. Establishing ownership and understanding of the customer
2. Monetising new services effectively
3. Achieving an economic return from rising data traffic
4. Improving operational simplicity and efficiency
5. Managing regulatory risk
6. Creating value through consolidation

The resulting changes in consumers' usage and loyalty can occur with breathtaking speed. As Figure 3 shows, operators' own mobile portals were UK customers' primary way of accessing mobile Internet services in 2007. Just one year later, operators' websites had plummeted down the rankings, to be superseded by an array of non-operator brands.

Put simply, as mobile usage behaviours have changed, mobile operators have progressively lost control of the value chain—and ultimately will lose the end customer. This process has seen the network's perceived value in the eyes of the customer steadily diminish, with the network increasingly downgraded towards the status of an undifferentiated 'dumb pipe' on which the customer's smartphone happens to operate. This commoditisation is evident in operators' relatively meagre revenues from digital services. Despite their key role in powering the online economy, operators end up with only an estimated 2% to 3% of total online fund flows in developed countries.

Adopting a customer-centric philosophy

To fight back against this commoditisation and re-establish the level of customer ownership and trust that they enjoyed in the 1990s, operators need to adopt a customer-centric philosophy and mind-set. This change is fully consistent with the shift from volume to value that we mentioned above. The first step is to reorient the organisation around the customer, in recognition both that all customers are different from one another and that a 'one-size-fits-all' strategy no longer works. This differentiation should be understood and applied not just between consumers and corporate customers but also between various segments within those classes of customers.

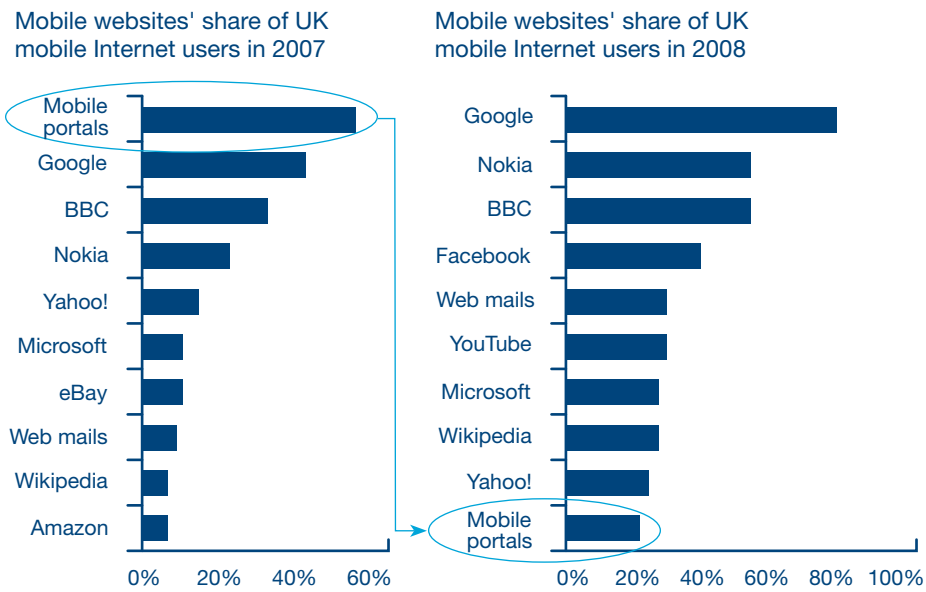
B2C: Four key elements

On the business-to-consumer (B2C) side, a customer-centric approach has four key elements: sophisticated management of customer value; a differentiated retail distribution strategy; intelligent and responsive bundling of offerings; and an ability to form and sustain value-creating partnerships. In combination, these supporting pillars can enable an operator to expand its loyal customer base while simultaneously growing its average revenue per user (ARPU) and progressively reducing its cost to serve.

Significant advances are under way in each of the four key aspects of consumer-focussed customer centricity. Many operators, including mobile network providers, are now offering bundled multi-play services—fixed, mobile, fixed broadband, TV—in an attempt to reposition themselves in the value chain and generate additional revenues. Some are also creating partnerships with alternative brands and distribution channels, enabling them to target various segments in parallel and avoid damaging or diluting their core brand.

In customer value management, operators increasingly are profiling, segmenting and managing customers against a customer lifetime value (CLV) framework, thereby moving away from the old one-size-fits-all approach. In retail distribution, mobile operators are tackling the challenge

Figure 3: Aggregate EBITDA margin for core voice services (mobile)



Source: PricewaterhouseCoopers' analysis

of direct distribution competition from online services. Using their retail outlets they are creating differentiation through personalised services, such as detailed advice on complex smartphone offerings. Some operators are also opening their own application stores.

Delivering such additional services and value to consumers can enable an operator to reposition its brand at the centre of consumers' digital services needs and avoid being seen as a dumb pipe. It also reasserts the underlying value of connectivity, by highlighting direct consumer benefits such as integration across access devices, high quality of service for network-centric devices, synergies with adjacent technologies to create broader bundles, and the customer's direct and regular contact with the operator—as opposed to the one-off transactional relationship many customers have with their device providers.

B2B: Converging into ICT services

Major customer opportunities also exist on the business-to-business (B2B) side, where convergence is drawing B2B suppliers from various backgrounds—operators, outsourcing and IT service suppliers, process reengineering specialists, offshore processing providers, and more—into one competitive market. As with the B2C market, communications operators that fail to respond adequately risk being disintermediated from direct customer relationships and left with the 'commodity plumbing' of a corporate customer's information and communications technology (ICT) connectivity.

To date, operators originating from a fixed heritage have made deeper inroads into the broader ICT market—especially with the larger corporate clients—than have their mobile counterparts. To get into the larger corporate customers, then, mobile players have focussed on growing their ICT capabilities, building direct relationships with small and medium enterprises, and partnering with fixed line operators. In emerging markets, however, the mobile brands often have more credibility in the B2B arena than do the fixed players, which creates greater opportunities in enterprise ICT services.

And across all business customers globally, the rising use of hosted services and the evolution towards virtualisation and cloud computing are elevating the role of the network as a key enabler of end-to-end service quality.

Strategic challenge 2: Monetising new services effectively

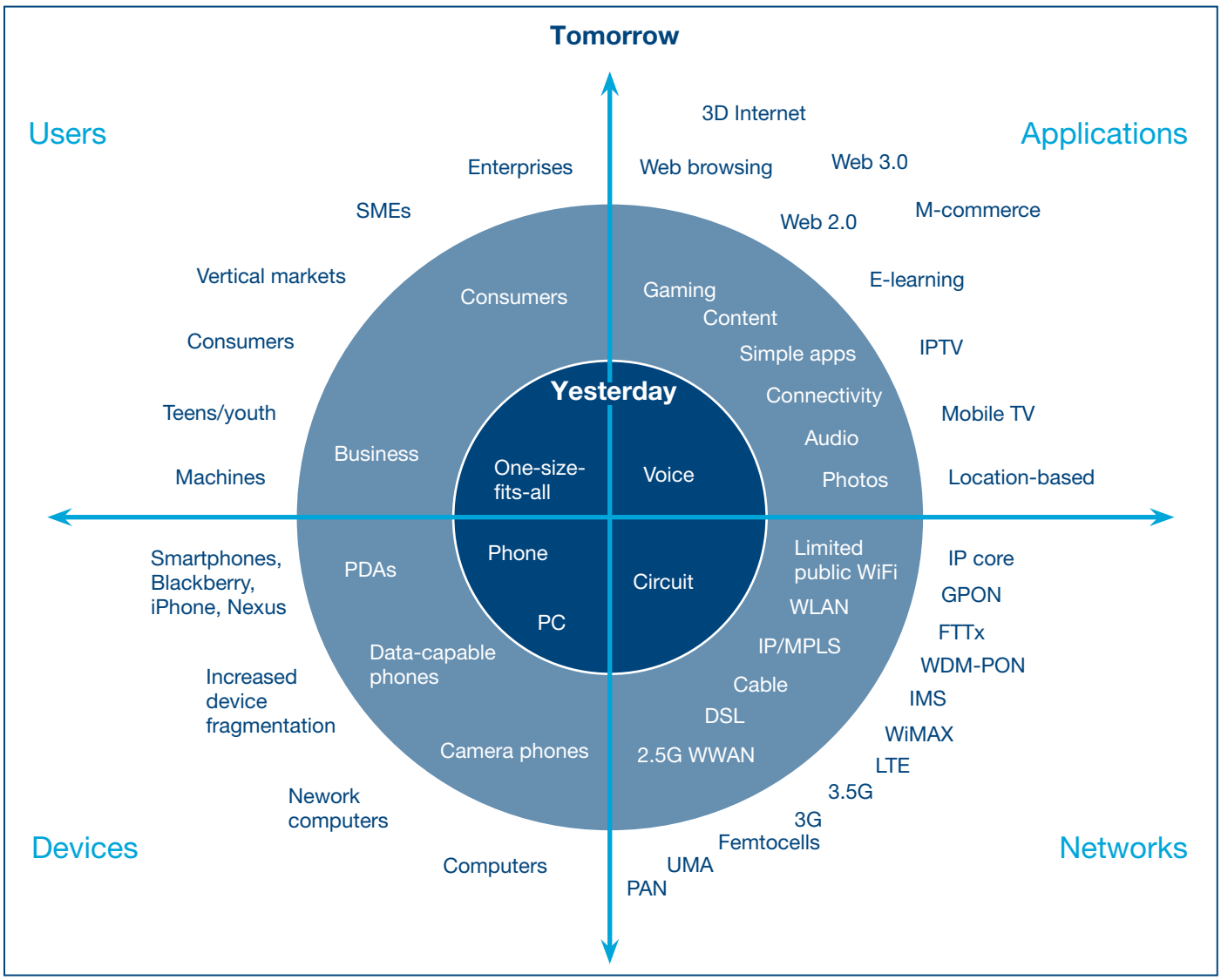
In recent years, the rising penetration of both fixed and wireless broadband has enabled the launch—and has underpinned the quality—of new online services that range from entertainment to eHealth to online and mobile banking. However, given their legacy of offering broadband access on a fixed-price, all-you-can-eat basis, operators are facing severe challenges in monetising the take-up of these services, beyond simply charging for the related connectivity.

Compounding the monetising challenge has been the explosive rise of the smartphone. This class of device, which has seen the mobile handset finally make the leap from optional gadget to indispensable and converged lifestyle tool, handles virtually everything people need. The smartphone's ever-expanding array of third-party applications now includes payment and secure access to buildings. That kind of customer-focussed innovation brings revenue. The three billion mobile applications downloaded for Apple iPhones in just 18 months realised some US$500 million in sales, one-third of which went to Apple. That was just the start: The mobile applications market is forecast to hit $6.2 billion in 2010 and $29 billion in 2013.

Meanwhile, from the operator's perspective, an ironic side effect of selling all-you-can-eat data packages is that the heaviest users of sophisticated new services can end up being the least profitable for the network carrying the data traffic. To address this situation and build their share of revenues from new services, communications providers need to take a fresh look at their positioning in today's ecosystem of network-centric digital services, which encompasses users, applications, devices and networks (*see Figure 4 on the following page*).

In search of a bigger slice of the revenues generated in and flowing through this ecosystem, a growing number of players across the communications value chain are crossing and expanding amongst the various quadrants. Witness Microsoft's announcement in April 2010 of the new Kin handset, targeted at social networking users. Similarly, operators need to examine

Figure 4: The emerging ecosystem of network-centric digital services



Source: PricewaterhouseCoopers' analysis

opportunities outside and beyond their 'home' quadrant to add value to their core transport services, and to participate more effectively in the revenue stream from the rising usage of new services. Increased customer centricity will support these kinds of efforts, and that will help develop deeper, more durable customer relationships, ones that create more value for both provider and customer.

Revisiting IPTV

Internet protocol television (IPTV) is an emerging service area with major potential for operators. Increasingly, the steady rise in bandwidth capacity and rolling out of next generation networks are bringing IPTV services back onto the agenda. The revenues operators have realised to date from IPTV generally have been modest, due partly to strong competition from cable and satellite providers. The availability of pervasive broadband Internet—both fixed and mobile—has the potential to subvert the traditional pay-TV models.

In the long run, Web-enabled television may serve as an embedded digital video recorder that allows viewers to access shows online from their TV set without having to remember to record a programme or being limited by the number of programmes they can record simultaneously. Pay-TV providers can see the threat coming and are looking to stay ahead of it with differentiated offerings, such as HDTV and 3D TV. However, further encouragement for operators is being provided by moves from competition regulators, such as Ofcom's recent decision in the United Kingdom to require Sky TV to cut the wholesale prices of its premium sports coverage.

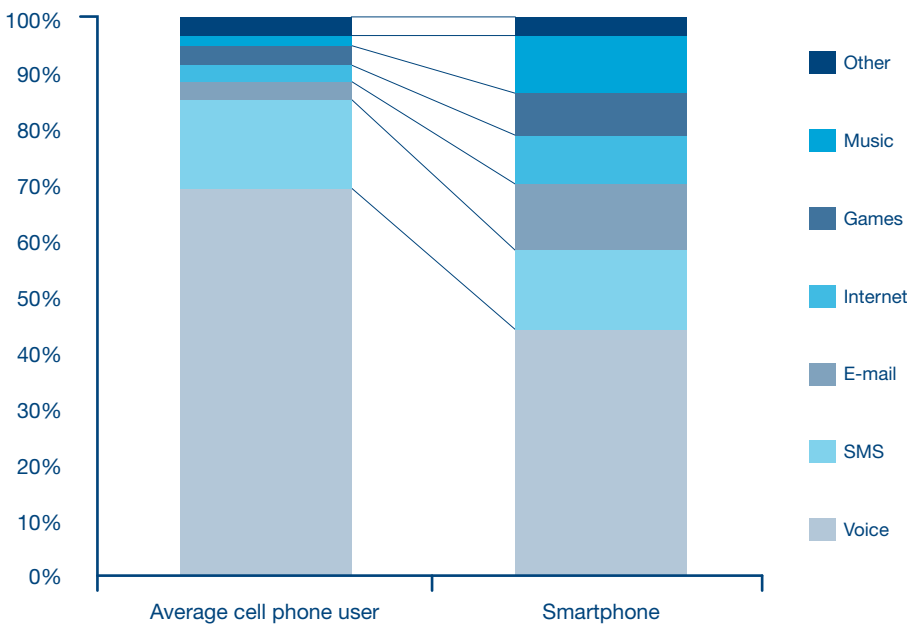
In our view, the whole arena of IPTV presents major opportunities for operators and should be revisited. Newer and emerging areas, such as eHealth and m-payments, also have significant potential. In many cases, these types of emerging services are best approached through collaborative, revenue-sharing partnerships, which bring access to critical expertise and hasten the time to market.

Strategic challenge 3: Achieving an economic return from rising data traffic

Consumers' changing behaviour and habits are now fueling a remorseless and exponential rise in the volumes of data traffic that operators have to carry across their networks. Yet customers generally are able to indulge in this increased usage of bandwidth at no marginal cost, because operators have sold them fixed-price, all-you-can-eat data access plans. Industry estimates in the United States suggest that just 3% of smartphone users are consuming 40% of all network traffic. As a result, the huge traffic growth on operators' networks is accompanied by declining ARPUs for data customers.

What drives the explosive demand for data is the rapid take-up and rising use of smartphones to access mobile Internet services, including streaming and downloading video content. Digital content is rapidly replacing voice as the main use of smartphones, and consumers are spending more time using them at the expense of other devices such as game consoles and PCs. Going forward, such personal applications as social networking may drive consumers' use of the Internet still further towards personal mobile devices. Figure 5 illustrates the dramatic impact that owning a smartphone has on the consumption habits of the average consumer.

Figure 5: Breakdown of daily use of mobile phones



Sources: Apple, PricewaterhouseCoopers' analysis

Against this background, widespread flat-rate pricing for access means operators are faced with investing in network capacity such as Long Term Evolution (LTE) and fibre to the home simply to maintain service levels, with no prospect of a reasonable return on that investment. At the same time, operators in some jurisdictions are hindered by the concept of network neutrality from striking bandwidth deals with specific application and content providers. Over time, this situation could become crippling for operators, unless they are able to change the way they charge for use of their networks.

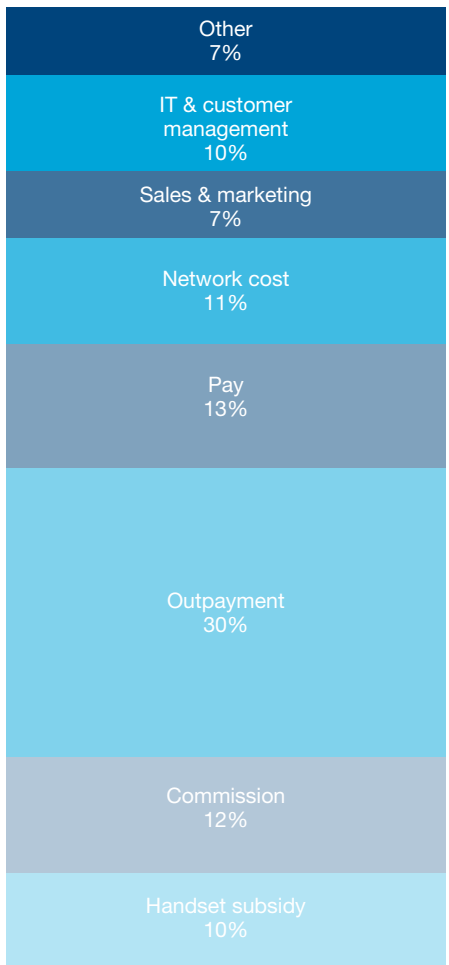
For mobile operators, the clearest way out of this impasse is to adopt usage-based charging models for mobile data. Taking that step might not be easy to sell to customers, but operators may have no choice but to take it—and some have done so already. In Japan, all-you-can-eat charging plans resulted in year-on-year data revenue growth of 11% in 2008, and operators responded by shifting away from these plans. To minimise customer resistance, such changes should highlight the benefits to relatively lower-usage customers, perhaps stressing that below-average users are effectively subsidising the heaviest ones. The repricing campaign might be accompanied also by educational initiatives to re-establish the core value of connectivity in the eyes of consumers.

Strategic challenge 4: Improving operational simplicity and efficiency

Operators' legacy of growth by consolidation and use of 'bolted-on' solutions to handle new services has left many of them with highly complex, inefficient and unwieldy operating models, often structured around organisational and product silos rather than the customer. Each of the key operational requirements facing operators today—customer centricity and responsiveness, ongoing cost reduction, integration and monetisation of new services, usage-based pricing, bundled offerings, collaboration, consolidation—demands that they simplify their operations to effect real change and realise the full benefits.

More generally, whatever internal and external challenges and changes operators face today and in the future, they will need greater organisational agility in order to respond to them effectively. One of the core competitive advantages leveraged by application and device suppliers in recent years has been their higher degree of agility and speed to market. To compete more effectively with them, operators need to mirror this capability. So, the only option for succeeding in the emerging digital value chain will be to realign operators' organisational and operating models to fit the new reality and support faster, more focussed execution of their future strategies.

Figure 6: Illustrative mobile network operator's cost stack



Source: PricewaterhouseCoopers' analysis

One of the key priorities of operational simplification is to achieve a significant, permanent and ongoing reduction in the cost base. The challenges are especially clear. As Figure 6 shows, a typical mobile network operator's customer-facing costs are relatively high, hampering its ability to compete in an increasingly cutthroat marketplace. Information technology and customer-management-related costs (including billing and customer relationship management systems) are about 10% of the total. That percentage is typically driven by the split of prepaid to postpaid customers and the degree of sophistication with which the company segments its customers. Sales and marketing—driven by the level of competition and the launch of new product programmes—accounts for a further 7%.

Against this background, operators are seeking to reduce expenditures and align their cost structures with a saturated, competitive and commoditised market. They are doing so by targeting ongoing cost initiatives across the organisation, from corporate centre to network operations, from IT to real estate management and from support functions to product life cycles. Operators are focussing more rigorously on their key differentiating sources of value, leading many to move support functions into horizontal shared services and outsource non-core activities, including the entire network. Some mobile players are being prompted to reduce capital expenditures and operating expenditures through network-sharing agreements.

Centralising intelligence

To reap the full benefits of such changes in terms of the cost and effectiveness of customer-facing operations, however, requires a critical step that many operators have yet to take. Operators need to remove customer, product and business intelligence from the various silos and centralise it on an enterprise-wide basis. By unifying and concentrating all this intelligence in a single entity, an operator benefits from greater efficiency, agility and responsiveness to external change—whether the change is in customer demand, competitive dynamics or regulation.

By clarifying the nature and location of key data, centralising intelligence also facilitates regulatory compliance, enterprise-wide standardisation and corporate actions, such as disposals and mergers and acquisitions. Especially clear are the benefits of unifying data on fixed and mobile customers: Centralisation supports joined-up and consistent management of multiproduct customers and provides greater clarity over their lifetime value.

That said, implementing centralisation of intelligence brings execution challenges. It is a particularly difficult step for international and global communications operators with various country operations, which often include minority holdings. Experience, though, shows that the effort is worthwhile.

Going forward, operators that successfully simplify operations will gain access to wider opportunities. One is that of becoming a service provider to other operators by giving them access to their more efficient core operational engine. This possibility could trigger the emergence of a new wave of virtualised operators. It also underlines the extent to which the frequently cited 'polarisation' between operators acting either as a dumb pipe or a content provider is overly simplistic. In practice, many hybrids and variations will exist between these two extremes, with a wide array of business models, some yet to emerge.

Strategic challenge 5: Managing regulatory risk

In the wake of the heavy and renewed interventionism by governments worldwide in response to the credit crunch, communications operators are in regulators' sights at both an industry and a national level. Partly as a result, regulation is increasingly a political issue rather than purely a matter of maintaining competition or protecting consumers. This also means it continues to vary widely by territory. Current change initiatives on the agenda in various countries and regions around the world include traditional price regulation, structural and functional separation between services and infrastructure, and actions to close the digital divide.

This ongoing state of flux creates significant uncertainty, complexity and risk for operators, especially international ones. Furthermore, operators are subject not only to industry regulation, but also to wider government, competition and tax compliance requirements.

With many governments seeking to raise their tax take to replenish their coffers, operators' strong and transparent cash flows present an attractive target.

In PwC's view, there is scope for positive change in both industry and tax regulation. If regulation stunts industry innovation by reducing the scope for exploiting innovation commercially, that hardly serves consumers' interests. So, industry regulators could focus less on price controls and more on the customer's wider interests in terms of quality and choice. Tax authorities, for their part, could look to incentivise good corporate behaviour and long-term wealth generation.

A particular concern in the regulatory field at the moment is network neutrality, which has emerged as the most prominent regulatory issue worldwide. In our view, net neutrality is a blunt and possibly counterproductive instrument, which could have the effect of hampering investment and innovation both by operators and by their wider ecosystem of suppliers and partners. For example, the developer of an online, medical diagnostic application that requires substantial bandwidth might find its offering's functionality is undermined by the requirement for operators to level the playing field by allocating bandwidth equally to all applications.

In our view, such developers should be able to strike deals with operators for guaranteed levels of bandwidth—and market forces, rather than some concept of an artificially levelled playing field, should determine what services are provided and how. Regulators need to accept that some providers will offer better and differentiated higher-value, higher-priced services. So long as new entrants can enter the market and companies are not profiteering from customers, the regulators should stand back.

Strategic challenge 6: Creating value through consolidation

Ongoing consolidation is an established aspect of the communications marketplace and will remain so. The reasons include the near-saturation and intense competition in mature markets; issues around the ownership of minority stakes by international operators in smaller markets; the need to access emerging technologies to fill gaps in capabilities; and the expansionist agenda of rapidly growing—and highly operationally efficient—emerging market operators.

In crowded, developed markets, the only alternative to industry consolidation is the ongoing destruction of shareholder value. PwC recently conducted some economic modelling of the optimal number of telcos in a marketplace, which showed that driving out duplication between operators in the market—far from harming the interests of consumers—actually can result in lower-priced services. The experience in the US market supports these findings: The country used to have two long distance and eight regional operators but now has three national players, and prices have not risen.

Deals will be driven as well by emerging market giants seeking exposure in developed countries, and in and between mature markets themselves. In general, consolidation will target three objectives economies of scale, fixed/mobile convergence and sustainable cost reduction to help provide a robust platform for growth in the digital era. Network-sharing agreements will continue as part of the drive to reduce overcapacity and costs, and the logical extension of this in some cases may be consolidation into fewer players.

Equally significantly, the previous dynamic of developed-market operators moving into emerging markets in search of growth may go into reverse. Emerging market operators from countries such as India are aggressively looking around for assets and may target the developed markets. These companies have built proven, low-cost operating models and may well be able to undercut the incumbents in mature markets—thereby possibly triggering a further round of consolidation.

In any consolidation deal, the priority is to create shareholder value. That objective has proved elusive in the past. In line with the strategic challenges we have highlighted, the optimal approach may be to integrate new operations closely in operational terms (including centralising intelligence), whilst remaining close to customers in each market through carefully segmented and targeted bundling, branding and pricing.

Conclusion: Into the new era

In the battle for positioning and revenues in a fragmenting and increasingly competitive communications value chain, operators are currently losing out to the new value creators. We believe the six strategic challenges we have described provide a sound framework for them to redress the balance.

There is no question that developments such as the explosive growth in broadband services, rapid take-up of smartphones and exponential rise in data traffic present major challenges to network operators. Those challenges are especially likely in an environment where the business model to deliver adequate financial returns on their network investments is still elusive.

However, operators can yet turn digital transformation to their advantage. They have the capacity, positioning and capabilities to re-establish the value of connectivity, build deeper and more lucrative relationships with customers and other participants in the value chain, and open up new revenue streams from innovative services and business models.

In our view, three prerequisites in particular will be critical to their success in achieving these goals. One is true customer centricity and understanding. The second is an ability to collaborate effectively to target and leverage new opportunities. And the third will be the heightened operational agility brought by operational simplification and centralised intelligence.

Put simply, data transformation is at the halfway stage, and operators are chasing the game. It's time for the fight-back.

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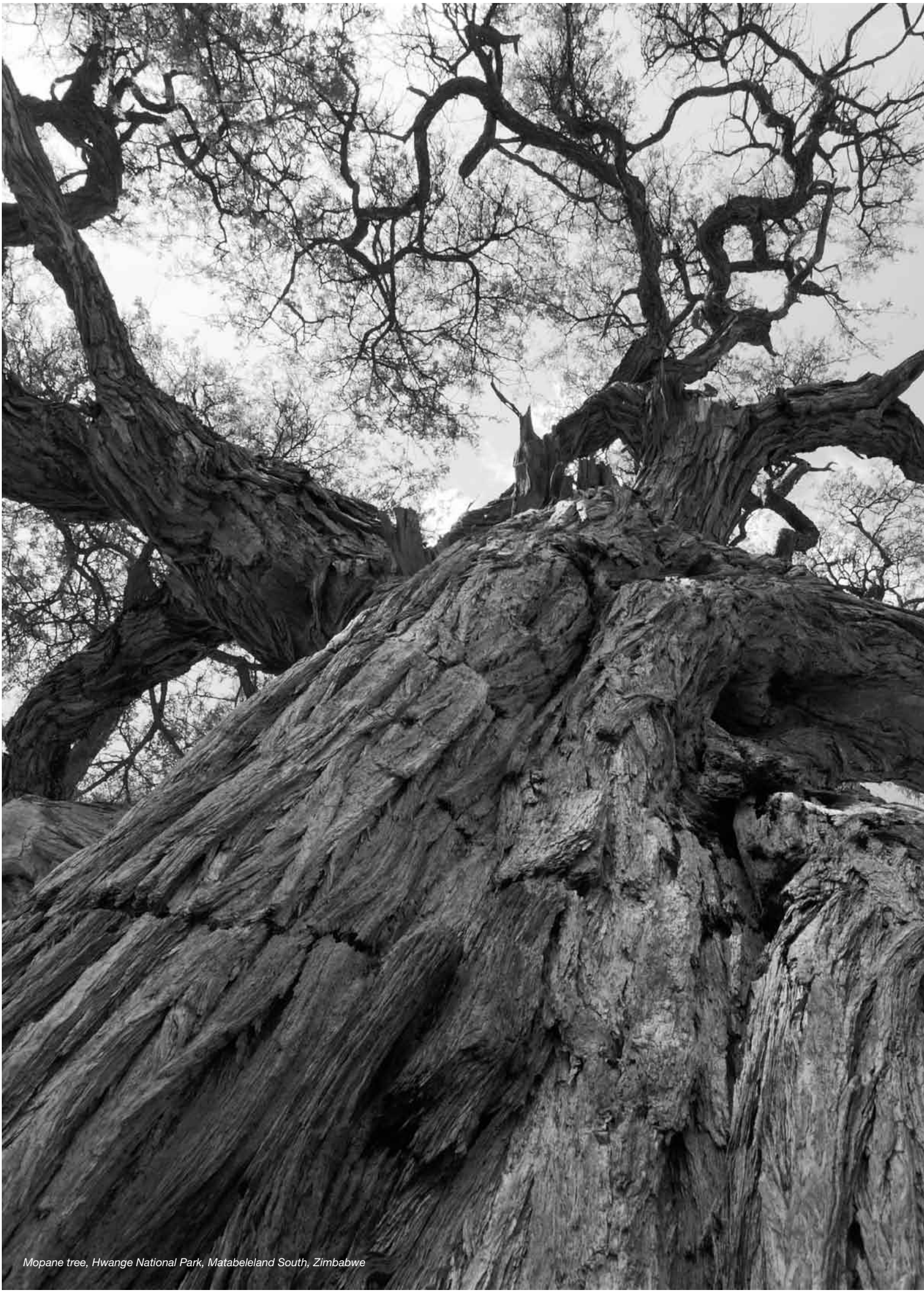

Mopane tree, Hwange National Park, Matabeleland South, Zimbabwe

Perspectives

There is no doubt that telecommunications has a pivotal role to play in the development of our society at large and it looks like the next wave of change will focus on enabling access to important resources, such as education, health care, and mobile commerce. The opportunities that these innovations bring for remote regions and developing countries are critical to bridging the digital and economic gaps that exist around the world, and can help improve and expand opportunities in developed markets. Telecommunications services have become—and will increasingly be—an integral part of our daily lives. The responsibilities that this brings to the industry are many: not just what is the right thing to do to help enhance the lives of people everywhere, but also the reality of the environmental impact this naturally brings.

Here, we present the perspectives of executives from various sectors that are looking to telecoms to help transform the way we do business and improve the accessibility of communications services to all of society.

An interview with:

Jyrki Pulkkinen Global e-Schools and Community Initiative

Everyone agrees that telecommunications services can dramatically alter the education system. Telecoms can change—and indeed is changing—the way people learn, share information, publish and interact both inside and outside a traditional classroom setting. The potential to help educate those without prior access to education is, in many developing countries, a huge promise to raise populations out of poverty and improve GDP. However, as with all new things, there are issues and debates about how, when, where and what will actually be done in this sector. Jyrki Pulkkinen, CEO of the Global e-Schools and Community Initiative (GeSCI), shares his opinions on what needs to be done by the various stakeholders in the educational value chain and his hopes for building a global knowledge society.

Communications Review: GeSCI was founded in 2003 and has a mission of helping advance knowledge building and sharing through ICT to create a knowledge society for all. Tell us about your core activities and how you help developing countries towards this goal.

Pulkkinen: The UN ICT taskforce established GeSCI to help ministries of education in developing countries to define their strategies, policies and implementation plans for large-scale ICT education programmes. GeSCI has supported ICT in education through national programmes in India, Bolivia, Namibia, Rwanda and Ghana, and through regional activities. In Africa, GeSCI has organised roundtables for ministers of education, and hundreds of ministry officials from 16 African countries have joined the African Knowledge Exchange community and attended seminars initiated by GeSCI. We are advisors; we do not do implementation, but we can help governments to build capacities for implementation and then create partnerships for the implementation phase. These partners can be development partners, funding partners or industrial partners that help the governments with implementation.

We also initiate and facilitate research programmes and projects that support policy makers in order to understand which ICT innovations work the best in developing countries and what kind of problems can be solved with ICT: what works, what doesn't work. In addition, we create knowledge tools that can be used in planning and implementing national ICT educational initiatives, such as total cost-of-ownership tools that help governments to calculate the overall costs of ICT implementation programmes or auditing tools for institutions to look at what kind of capacity they lack and what they should build on.

Moreover, we facilitate research to advise policy makers on creating environments that are more conducive to those ICT innovations that are to be upscaled. For example, evaluation research can help a ministry to understand the current situation in its country. Often policy makers are not aware of innovative solutions that might be available or whether the solutions are feasible in their own country. Therefore, GeSCI is trying to create so-called 'living labs', research-driven pilots that help the policy makers to understand what works in practice and what kind of policy environment is needed to sustain these solutions. Many governments want to upscale only one solution that fits all the schools and they don't necessarily see the different ways of upscaling to facilitate different processes in education. Current mainstream research doesn't really look at the problems in developing countries but, rather, it looks at problems in developed countries, such as the capacity of the broadband networks in high-end educational applications like video conferencing and video-based learning materials, or the methodologies in a classroom environment where there are only 20 students with a wealth of learning resources or personal access to ICT.

Communications Review: How are your activities funded?

Pulkkinen: From the beginning GeSCI has been funded by government donors including Ireland, Sweden, Finland and Switzerland. Now, new funding partners are coming in and we are broadening our funding base to include private sector partners for the first time.

We would like to engage the private sector to help create Knowledge Partnerships with GeSCI, to facilitate applied innovative research or knowledge-sharing programmes to advise policy makers on the uses of ICT in education. One area of interest is the accessibility of educational services in rural areas,

especially by utilising mobile/ wireless networks that are widely available in developing countries. Another area is training teachers on ICT in education, new skills development and quality of learning. Obviously, we don't use private sector funding directly for the policy work that we do with governments.

Communications Review:
So does that mean that your activities have been necessarily constrained by the amount of public financing that has been available?

Pulkkinen: Yes. One of the biggest issues in the last few years has been the global recession. Many of our current funding agencies are facing financial difficulties themselves so the development funds from public donors have gone down. The private sector is having the same problems. What we want to do is combine different funding now and broaden our donor base to make our operations more sustainable in the long run.

Unfortunately, public sector donors have not been very committed to the funding of the development goals and principles they agreed to at the World Summit on the Information Society [WSIS]. There has been commitment at the political level rather than the funding level. Now governments seem to have a new commitment: the environment and climate change. Funds, at least for the near future, are following those political initiatives; donors seem to have forgotten what they promised for the information society and many initiatives established by the donors themselves have been suffering. However, GeSCI has survived fairly well through the recession and the prospects for the future look good at the moment.

Communications Review:
It seems that by stimulating education you stimulate GDP and that gives governments a greater ability to invest further.

Pulkkinen: Exactly: there is evidence to support that idea and the growth strategies of developed countries are based on this understanding. However, if you look at the country level, particularly in developing countries, there are fewer donor agencies that are supporting the education sector as such. A few years ago, most of the big donors were supporting education initiatives in most of the countries. Now many of them are reducing the number of countries receiving support for the education sector and perhaps are funding other sectors like environment, governance and economic development. Abandoning the education sector may be short sighted, as education contributes to all the other sectors by providing the required skills and know-how for economic development, especially if ICT is used in education in the appropriate ways.

Communications Review:
What do you see as the biggest barriers to advancing education and knowledge sharing in remote and rural areas?

Pulkkinen: If you look at the mainstream ICT in education debates online, it is quite shocking that they don't speak about accessibility any more. In Africa and many other developing countries, the accessibility to education is still a problem, and accessibility to education goes hand-in-hand with accessibility to ICT and other communication services that are needed in society. When an education system faces accessibility problems, usually there is a lack of electricity and a lack of communication networks as well. This is the case in rural Africa and in some of the big slums in big cities.

Mobile communications could help solve some of the accessibility problems in rural areas because the coverage is already there; people have mobile phones and penetration is very high. However, most of the educational applications are designed for PCs and fit for a classroom environment rather than for helping children and students to reach educational services outside the classroom. That is one of the problems that the debate seems to have forgotten: education for all. This is an area where GeSCI wants to make a difference. We would be interested in working together with the industry to define the needs and possibilities for mobile and wireless technologies to transform education to be more inclusive. We have even chosen the motto for our new strategy, 'Building a Knowledge Society for All', which means that we need to explore how ICT can provide more inclusive access to education, knowledge and innovation in society, because they are all cornerstones for development.

At the moment, mobile technologies play only a marginal role in education. It really is a pity, because mobile technologies are widely available among the young people in developing countries. Almost half of the population in Sub-Saharan Africa are under 20 years old. They are eager to use mobile phones for accessing all kinds of services online. However, the cost of mobile services is an issue, specifically for the young population, as they may not have jobs and money to pay for

the services themselves. Through education and skills development they can solve both of these problems: get a job and earn income for themselves. This is a problem that could be seen as an investment opportunity from the telecom operators' perspective. If operators invest in expanding the customer base in a country, they could subsidise educational use of mobile phones. This would create a new, wealthier generation that is ready and willing to use online services through mobile technology.

Mobile operators should have more long-term goals in their business and contribute to the building of a more inclusive knowledge society where all can afford mobile Internet services. Essentially, communications costs are just too high for educational purposes in developing countries. It seems to me that the telecom operators are not willing to look at this market sector for the long term. I don't think they appreciate that they can grow a stable new client base by investing a little bit in this sector.

Communications Review: It's difficult. Most telcos are public companies that have a responsibility to their shareholders.

Pulkkinen: If you talk to the different sectors of the telecommunications industry, they all claim they are doing what they can to reduce costs and they point a finger at someone else in the sector as being the problem. The manufacturers of mobile phones and devices say they try to push the price of handhelds very low in emerging markets, but they blame the telecommunications companies. If you speak to the telecommunications companies, they have a different answer. There seem to be some aspects of telecommunications that don't really allow the prices for educational use to go lower than the market rate at the moment—in developed and developing countries.

Communications Review: How is one going to break through here? Is it going to be necessary for national governments to provide subsidies?

Pulkkinen: With telecommunications liberalisation, the idea is reduced regulation allows the market to set prices. That has been working quite well in many cases. Regulation can also be used to steer the markets to deliver the services where they are needed and at affordable prices. If there is a national interest that is also of long-term interest to the industry, some of the regulations could be used to steer services in the right direction. While they may not be the best business initiatives for the industry in the short term, over the long run they could prove to create a broader, more affordable market and a larger, wealthier customer base.

Communications Review: Are there any initiatives that you have seen put in place in one region that would serve as a benchmark for other countries? Any success stories that you can share?

Pulkkinen: There are many; however a number of them are pilots where there is no intention to upgrade them to larger-scale implementations. Unfortunately, that is something we see often due to the lack of funding.

Some solutions that could have a great impact include combining mobile technology and satellite-based Internet provision for delivering support and learning materials for teachers in remote rural schools. This has been piloted already in some countries and could be useful in many others. Also, the creation of independent GSM cells providing free mobile data connectivity in rural villages could be useful for educational institutions and their students, if allowed by the telcos.

There are also good practices in the area of policy-making processes on ICT in education. In Namibia, GeSCI helped create multi-stakeholder partnerships that involved different sectors of society working together. The Ministry of Education had a very ambitious national plan for ICT and education. GeSCI helped it to create partnerships with public sector donors, including the development banks. There were partnerships with private sector companies to help implement various solutions, and civil society and academic partners to help advise the ministry. The result was that the Namibian Minister for Education was able to multiply the resources he initially had for the implementation process. It was very successful not only in creating helpful knowledge partnerships but also in mobilising the resources for the implementation phase.

Another example is in Rwanda where GeSCI has been providing strategic advice to the government. They are using the development of a knowledge society as a cornerstone for the development of the whole country. Rwanda is a small country and political consensus on knowledge society development seems to be easy to achieve, not only within the Ministry of Education, but also the other ministries, which have the same understanding and goal of developing Rwanda as a knowledge society. The policy drive, policy coordination and the national vision set a good example for others.

Communications Review:
What about in the established markets? How do you see education and knowledge sharing changing in those markets through ICT, and what has been, or will be, the impact?

Pulkkinen: That's an interesting question. I have a personal view on this because more than 10 years ago, in Finland, I had a dotcom company that started to provide online learning management services for Finnish educational organisations, universities and schools. At that time, the sector was not established and there were a lot of debates on the concept and who should do what.

Today, the business is more established and has gone in the service direction that we anticipated more than 10 years ago. Together with cloud computing technology, the service model will be even stronger in the future. The main question for the future may be the accessibility of these services. Where and with which technologies can the services be accessed? Should students come to the classroom in order to access online services, or can they access services from home or some other location? All this is possible with current mobile and wireless technologies, but the education system is not necessarily ready for it yet.

We need to figure out how to transform the educational system to be more inclusive but also more open in society. We need to break down the walls between the classrooms and work places, so that lifelong learning is made possible in practice. If a worker is able to upgrade his or her standards in secondary education or in vocational education from the workplace via ICT, the same educational services would also allow the dropouts and poor students from rural areas and slums to participate in the same education. This is not a technical problem. It is a problem with the openness of the educational system and, again, with the cost of telecommunications services in the educational domain.

What will be the impact? The impact, apart from a more relevant educational system, will be that the private sector can also participate in educational markets without focusing on educational content provision. The publishing companies are doing that piece very well. But the telecommunication companies could find a role in service provision of learning management systems and other systems and services that education may need.

Communications Review:
So you see an alliance or partnership between the telcos and the education providers?

Pulkkinen: Exactly. If the telcos aren't willing to subsidise the line costs, as such, they could actually develop more comprehensive services so the line cost is not the issue anymore. They could make the whole service package more affordable. That would solve some of the affordability problems in developing countries. Affordability is just as likely to be a problem in established markets, too. The educational institutions in Europe don't have huge amounts of money for these kind of services. Telcos have to look at this sector once again and lower the prices. In the late '90s, when my company developed SMS data reminders for parents, nobody wanted to pay for this service because the SMS cost alone was already too high without the content development costs. Developing content is not commercially viable if telecommunication costs are too high. This could be one way of addressing all markets to develop more comprehensive and affordable services for education.

Many telecom operators, especially the mobile companies, have been thinking about this already and they have pilot programmes in place. At the conceptual level, I believe that many of these companies that are trying to get into the education market have asked the wrong questions and so they have the wrong answers. They try to compete with the computers and traditional classroom-based ICT implementation. They have not really looked at how they can change the educational systems and make education more accessible for the rest of the people who are not in the classroom. That still remains a problem in developing countries, and developed countries as well. It's a pity that some telecommunication companies have withdrawn from the idea of going into this sector at all because of the conceptual problems. GeSCI has realised this problem and that's why we are now trying to get some of the private sector companies involved in our knowledge partnership research programmes and knowledge sharing programmes to target this specific issue.

Communications Review:
The communications industry is innovating all the time. Is there a service or a device that you wish were available to help in educational matters that does not exist currently?

Pulkkinen: We do have an interest in developing new gadgets and concepts through our knowledge partnerships with the private sector. This is exactly what we want to find

out through innovative research conducted jointly with the private sector. We are looking especially at the social and process innovations that the industry is exploring, because we may have a different perspective on these innovations.

In my discussions with educators and other developers of ICT services, the most usable device for the current education system in a classroom context could be a tablet, like an e-book reader, but more comprehensive: a device that has all the basic functions to read, write, calculate and draw, as well as includes the required communications feeds in order to access books online and traditional learning materials and for total interaction facilitated by the teacher and educators for learning. It needs two-way communication facilities, whether they are voice- or data-based. You need communications capability in order to learn, as learning is social by nature. You also need access to interesting materials. You need some tools to process the information. And both the device and the connectivity have to be affordable.

However, we should also question the relevance of classroom-based education and the technology that fits in that context. Is a classroom the best way to organise education in an inclusive knowledge society? What is the technology that can transform the education system to be more inclusive, more relevant and more responsive for the needs of the learners and the development of the whole society? This might be a more relevant question, rather than asking what technology fits traditional classroom teaching. Just imagine: in the banking sector this question resulted in online banking that is available worldwide. If they had followed the traditional processes and a 'classroom approach', we would have banks with loads of computers on desks, but still serving the customers in the traditional ways. The same applies in education: ICT can only help education if the basic processes are developed at the same time.

Jyrki Pulkkinen is the CEO of GeSCI. Prior to joining GeSCI, Mr. Pulkkinen was a senior adviser at the Ministry for Foreign Affairs of Finland, where he was responsible for development policies related to Information Society & ICT, Science and Technology and Innovations.

Mr. Pulkkinen has contributed to various development cooperation programmes as a team leader and a voluntary consultant, advising, appraising and evaluating programmes especially related to ICT and education. His academic background ranges from teaching to research and project management. He has published several international and scientific articles related to his research activities and he completed his PhD at the University of Oulu in 2004. Mr. Pulkkinen is the founder of the Research Unit for Educational Technology at the University of Oulu, where he has served for many years as an Assistant Professor of Educational Technology.

For more information, visit the organisation's website at www.gesci.org.

An interview with:
Casey Harrell
Greenpeace International

As Greenpeace champions ways to address global warming issues on multiple fronts, the information communications and technology sectors are not exempt from the organisation's campaigns to fuel changes from the sector. Here we talk with Casey Harrell, who leads Greenpeace International's efforts to engage the ICT sectors to help reduce greenhouse gas emissions in their products and services, as well as enable other sectors to reduce theirs. In his view, one of the biggest challenges to success is not in taking action, but in getting the industry players to cooperate with each other.

Communications Review: Greenpeace has published several reports that assess the role that ICT companies play in contributing to and reducing emissions. What was the impetus behind Greenpeace taking an interest in the ICT sectors?

Harrell: Our offices in India and China began highlighting the role that electronic waste was playing in their countries as a key environmental issue. There is a lot of electronic waste shipped from developed countries to these countries, countries that do not have the infrastructure to deal with the millions of tons of electronic waste they are receiving. The waste includes everything from cellular phones and computers to much larger electronics. Given the lack of infrastructure, this waste was mainly being open-burned for black market copper, gold and scrap. It was in 2004 that we began to try in earnest to get at this issue and see what we could do at an international level, whether it was legislatively or with voluntary action by the corporate sector. We published our first quarterly *Guide to Greener Electronics* in June 2006.

We went from the dumping grounds into the corporate boardrooms of many global ICT companies. We went in and tried to make sure that these companies understood the science, understood the epidemiological and health impacts that this waste was having in these communities. We talked about designing out the types of materials that were leaking when burnt by people overseas, and trying to design with a longer arc in place so that the companies could take these products back and reuse and recycle them.

We argued that if these companies were early adopters in phasing out some of the worst chemicals—working through this very long supply chain that the ICT industry has—they could be in a financially advantageous position. Besides the advantage of getting ahead of a regulatory curve, there are also benefits to marketing products as green, as Apple and Dell have done. Many consumer opinion polls suggest consumers prefer to buy green electronics. Additionally, manufacturers who make their products with less toxic inputs will have a less costly (and more reusable) product to pay for at end-of-life disposal. With more regulation regarding design and waste management for the ICT industry coming down the pipeline, we argued that if the companies got ahead of the regulation, they would actually be able to make more money.

We began to have fruitful conversations to build rapport with internal advocates who were playing a similar role inside the ICT organisations to the role we were playing outside. From that, we began to add more defined criteria to reducing this e-waste problem, which are in our quarterly *Guide to Greener Electronics* and our product assessments. This includes questions on chemical design, chemical management, and waste management polices and practices. The companies can see the value proposition in saving energy and how proper energy management translates directly into cost savings.

Communications Review: What changes should ICT companies consider making to reduce the impact of emissions on the environment? What are your top priorities?

Harrell: I can break it down into three baskets. One basket is within their company footprint, which is where many of the ICT companies are doing quite well, especially in comparison with other big industrial sectors. There are a couple of reasons for this. One, the footprint for ICT companies is relatively small because most of these companies externalise their supply chains. Manufacturing is not in-house, which means the companies are going to have a lighter operational footprint because they're really just concerned with transit, marketing and office buildings. This involves activities such as changing the light bulbs, doing an energy audit, things of that nature, but also applying some of the more cutting-edge

technology they develop to help reduce emissions. This is especially the case with more mature players who have been around longer.

The second basket is the efficiency of the products and services that ICT companies offer. This is probably more relevant to companies that produce hardware. Generally speaking, you could estimate the actual energy use of the product can account for up to 50% or more of the overall cradle-to-grave emissions profile.

The third basket is the actual embedded energy in the supply chain of the product, everything from the materials to the manufacture and assembly. Some of the Asian global brands do make portions of their products, but companies like Apple, HP and Dell make very little, if any, of the things that they sell. The same goes for European and North American-based telecos, as the materials that they buy for laying the networks and the handsets that they sell are all manufactured by third parties. This basket, unfortunately, is generally difficult to measure. One of the things that has been a challenge is trying to get a handle on supply chain issues and management because the tail is so long and there are so many companies involved, many of which are operating in national economies that do not have basic greenhouse gas accounting measurements in place, such as China.

We've seen some companies invest heavily in international working groups and bodies that are trying to get a collective handle on this, because many of the big brands are using roughly the same players throughout the supply chain. If Nokia were to get a handle on its supply chain emissions, for example, then Sony Ericsson would not have to reinvent the entire process. There is value in working collectively. However, it's not what the industry does best in most respects.

Imagine if these big brands were heavily involved in the process to get their component and product suppliers to do an energy audit and to manage greenhouse gases. Potentially they would see the cost savings passed along to them in cheaper products. That's the motivating factor. I would say of all the areas, this is definitely the most complex puzzle to solve.

Communications Review: What about efforts in the regulatory arena? What should ICT companies be doing to advocate for regulations or changes to help them in their efforts to reduce emissions?

Harrell: At present, the ICT sector is punching below its weight, so to speak, when it comes to environmental regulatory advocacy. There are clear profit motivational reasons why ICT companies need to be more involved in advocacy. In the climate/energy policy debate, there are a number of studies, including the Climate Group and GESI's Smart 2020 analysis, that show how ICT can enable at least 15% of the much-needed reductions in greenhouse gases globally by 2020 through deploying technologies for smarter buildings, smart grids, more intelligent logistics and transportation, etc. The key is aggressive deployment of the technology, which requires government and private industry research and development and policies that set the rules and market signals for proper deployment.

The sector is being out-spent and out-manoeuvred in terms of broader energy policy by most other industries that produce a percentage of GDP at the rate of the ICT industry. The World Resource Institute has been working through supply chain emissions following the Greenhouse Gas Protocol, and a number of ICT companies are involved and taking a leadership position in this area, including Deutsche Telekom, IBM, Rogers Communications and SAP. Unfortunately, though, if you talk to companies about this issue, they say that there's only so much they can do without broader forces in play, meaning China has to institute laws in which local companies have to account for their greenhouse gas emissions otherwise these ICT companies cannot do the role of a government all by themselves. And that's true.

One of the big footprint issues that we are seeing more of—and this links in with policy and is going to be a huge challenge for the industry—is cloud computing and data centre growth. When you look at the number of gadgets, the number of services, and the reliance on technology and communications that our society has, whether we're talking developed or developing countries, our dependence is quite big and still growing. But in terms of where it's being concentrated in a nice, manageable and easy-to-showcase footprint fashion is our increasing reliance on the cloud. Mobile phones are not simply rotary dial, one-way-to-communicate-via-voice devices; these are truly smarter devices than we've ever experienced in a mobile product. We have essentially these very small computers requiring massive amounts of processing power via the cloud. These devices and the companies that are providing them or using the technology to power them are increasingly reliant upon

data centres. In a lot of countries, when we look at new electricity-based demand, we're seeing that data centres are one of—if not the leading—drivers of that growth.

Many telecom operators have started to address this issue. Almost everything you read about this sector contains the words 'green IT' or 'green data centres'. Really, though, what they are talking about in 99% of the cases is their PUE [power usage effectiveness], which is just the efficiency of the data centre. We're not surprised that there is an effort to go green here because these companies buy a tremendous amount of juice from the grid and obviously want it to be used in the most efficient way possible. It makes economic sense.

If you talk to any of the companies that are building data centres and ask them what is the rationale for where they site a data centre, they'll say it is environmental. They are looking for fast pipes and for security but also want to build the centres where they can be naturally cooled, where the cooling costs are low. Our response is, "You're also looking for really cheap electricity." And they'll say, "Well sure, of course." So our next question is, "How does that type of electricity play into your demand?" And they'll say, "Well, we're definitely trying to offset our emissions. We're planting trees here; we're buying renewable energy credits there."

But the issue is bigger than that. There are places where there are already too many data centres, such as North Carolina in the United States. An issue currently being debated in that state is whether or not to expand an incredibly dirty, 60-year-old, coal-fired power station, which should be closed down for numerous health and global warming reasons. However, the state of North Carolina gave Google and Apple huge subsidies to build massive data centres right next to the coal plant at the centre of this huge policy fight. We tell these companies that it doesn't really matter how many green electrons you're offsetting in the grid, or that you're trying to buy the greenest power possible, because the fact that you need to power these massive data centres has influenced a policy debate on whether or not more coal is going to be used in the grid in North Carolina.

Google has recognised that its growth is greatly outstripping its ability to have a lower footprint profile because of the way our current energy policies are around the world, so it is seeding the Google.org philanthropic businesses with renewable energy investments. But they are also getting out in the policy arena and saying they cannot decouple growth from emissions under current energy policy. It's the truth. This is where we need focus, to decouple these things. Google is advocating probably better than any ICT company, making very bold, clear policy statements, saying we need more renewables as part of our electricity; we need a hard price on carbon to change the way our energy mix is. Google also invested in certain energy and policy advocates that many ICT companies don't have yet.

It's a challenge. Many ICT companies work very comfortably with utilities because they are major customers. They don't want to threaten the power structure, but on the advocacy side we see this as an issue. Take the US again, for example. Last year smart grid funding through the US Stimulus Package was significant and ICT companies had their hands out to get government money. There's nothing risky in that. It's free money. The grid is incredibly stupid. Without a doubt that money is going to make our grid smarter, but how much smarter if companies don't really compete against each other? These companies are getting free money from the government. Right now they can work in a fairly cosy relationship with the utilities. They shouldn't necessarily, though. Utilities are going to want to hold onto the data of the smart grid. There's an entire customer base that ICT companies do not have on home energy management. If utilities are the owners of the data that the ICT industry can help facilitate, then the consumers—whether ordinary home consumers or big business consumers—are not as in control of their own energy management. If consumers are not in control of their own energy management, the ICT industry is losing out on potential applications that it could be selling to consumers.

Communications Review: Are there any other areas where you think that the telco operators could be either benefiting from a more environmentally friendly approach, or developing further applications or services which will benefit others?

Harrell: In terms of solution opportunities, we're seeing some of the operators play a role in wireless grid management issues. Smart meter connectivity issues and information management could overlap in terms of what's referred to as smart buildings.

As we move into smarter phones, there are also opportunities in dematerialisation. Take something like the Apple iPad, which is really not an e-reader but a mobile device. Currently it is not wired to make telephone calls, but in the United States it's part of AT&T's data management plan; some models have a 3G network link. The core

point for devices like the iPad is to take a lot of media that has traditionally been in material form and dematerialise it to enable you to read your books and magazines on the devices.

There are transportation ICT solution opportunities with networks: smart parking systems, distributed storage systems, traffic congestion pricing management, the latter having been attempted in London and defeated in New York at the moment. It's a question of how telecoms can get a piece of this.

One of the things that telecommunications companies will talk about in terms of responsible or sustainable behaviour is their recycling programmes. It's an easy way to be green, plus it's convenient for the operator to get someone in the door to buy its next product. I think the bigger challenge on sustainable behaviour for telecom companies is how do they decouple their ability to turn a profit with the ability to get a new piece of hardware into the hands of their rapidly-growing consumer numbers? Green design, better recycling, energy management, it's all great, but what are they doing on planned obsolescence? Communications devices have a shorter and shorter life span and if there's a way for the telecommunications industry to decouple those issues of profit and planned obsolescence, that might be, if we're talking about a radical idea, just what we need. Operators are beginning to understand that some money can be made through applications in the cloud. That doesn't preclude us, though, from getting a new iPhone or selling a brand new version of an iPhone every nine to 12 months. It doesn't matter how big the app store is, it appears. It's an interesting conundrum.

Another challenge for telecommunications companies, which is not unique to the sector, but it's there, is that there needs to be better consumer education about the companies' environmental initiatives. Let's move it from being the eighth click from the website or an eight point font on page 13 of the booklet that you're going to throw away right after you buy your product; that is not the place to talk about environmental initiatives. There needs to be better consumer education, there needs to be a better relationship. We are starting to see a couple of innovations, like the Samsung Reclaim phone that recently came out. The advertising on the box has information about what it is and what it's not, front and centre. The industry needs to do more in this regard, to make sure that it's not niche, that what Samsung is doing is a replacement of a previous business practice. Is that radical? It might be to some. I wish it weren't.

Communications Review: Where do you see the greatest opportunities for these companies to help reduce emissions in other industries?

Harrell: One narrative that is beginning to dominate is work around smart grids. It integrates everything from hardware manufacturers to software providers to network operators. Everybody's going to have a role and there are a lot of pilot projects already happening. Standard settings are underway. I would say that the greatest opportunity for a telco, or even just the ICT industry in general, to reduce emissions in a meaningful way in the next five years is probably smart grids. Ultimately, we must set stronger standards because we don't want a slightly less dumb grid, we want a truly smart grid. We don't want a grid that just uses fossil fuels more efficiently. In one way that would be fine but, when you overlay that with the climate catastrophe that's staring us in the face, we've got to use this smart grid to have better knowledge of our energy use so that we can better deploy clean, renewable energy into our grids.

Communications Review: Where do you think there could be greater collaboration between Greenpeace and the communications industry in order to address some of these issues and create a win-win situation for both?

Harrell: Despite the more conciliatory approach that Greenpeace has in this sector, we spend a lot of time working on building rapport with ICT companies. It might be that there are other external stakeholders in the environmental NGO [non-governmental organisation] world that would be better at exclusive collaboration with the industry. That doesn't mean that Greenpeace can't be involved. It just means that there might be a perception about what we can do and also what we might see as our role, because from time to time we're still going to take companies to task on poor behaviour. For some companies that's fair, but other companies actually just want their external stakeholders to be ones that are always praising them. We've experienced that before.

That said, I think that there are some specific policies and endeavours on which we can work together. Take, as an example, India, where the telecommunications industry has outstripped the grid. There are more cell towers in places where they cannot link into the grid, and there are cell towers that are currently running on diesel. A lot

of telecommunications demand is outside where the grid networks in India are powered. This is the same with Africa and many other developing countries, and there are challenges around that.

For instance, the government of India is committed to do whatever it takes to get the other 500 million people in the country plugged into the grid by 2012. You can imagine that there is not going to be much attention given to how efficient the energy is and what the low carbon impact of the fuel sources is if you've got to get 500 million people plugged into a grid in two and a half years. There are plenty of opportunities where the telecommunications sector can play a role in terms of providing a cheaper energy source for the long term. We know that sooner or later developing countries are going to have hard caps on their emissions and the cost of certain fuels will be fully accounted in a more robust way than it currently is, where most of the costs are externalised. Building out now in terms of using dirty fuel is not going to be a long-term profitable opportunity.

Looking at a win-win situation, forethought on the build out in the developing world from the telecommunications sector would be an obvious one for the longer term. That's a challenge because most shareholders are focused on the next three quarters and most businesses are focused on the next three quarters. But in terms of leadership, the ICT industry has a streak of being visionary, so I think that perhaps it's possible to lobby together for more renewable energy and acting on that commitment in terms of reducing price. Because in many places, in places like India, there's tremendous renewable energy potential that's not tapped at all.

We're also looking for companies to showcase their activity with products and services that are reducing greenhouse gas emissions, because there's no way to account for this currently. There are no standards but there's a lot of hand waving by companies and what we're asking for are case studies that explain the assumptions made when an ICT company says its products and services saved half a million metric tons of CO_2 or CO_2-equivalent gases. We ultimately want companies to show their cards as an attempt that will spur on the standard-setting process. There's no reason for these companies to not share their data. Endless tech is not necessarily a good thing unless you can actually show that the energy savings are taking place.

Casey Harrell is an IT analyst/ campaign coordinator at Greenpeace International, where he heads the organisation's campaign for increased climate leadership in the information technology sector.

An experienced strategist, he has campaigned for over 12 years for increased environmental protection and supply chain transparency at Greenpeace, ForestEthics and the National Environmental Trust. Mr. Harrell is responsible for producing Greenpeace's green product assessments, managing the organisation's corporate engagement within the IT sector, as well as contributing to assessments for Greenpeace's *Guide to Greener Electronics* and *Cool IT* leaderboard. Mr. Harrell is a graduate of Duke University.

For more information visit the organisation's website at www.greenpeace.org.

An interview with:
Dr. Hamadoun Touré International Telecommunication Union

For 145 years, the International Telecommunication Union (ITU) has been helping developed and developing countries with a host of communications issues. Its mission is to enable the growth and sustained development of telecommunications and information networks, and to facilitate universal access so that people everywhere can participate in, and benefit from, the emerging information society and global economy. Here, Secretary-General Hamadoun Touré shares his thoughts on the importance of broadband, the increasing threat of cyber crime, innovation driven by necessity, and how the private and public sectors can work together to create the knowledge society of the future.

Communications Review:
The ITU has just announced a new campaign around broadband. What are you seeking to achieve with this initiative?

Touré: The ITU is trying to help other sectors accelerate progress towards achieving the Millennium Development Goals [*editor's note: The MDGs were agreed by the UN in 2000*] using information and communications technologies [ICT]. When the UN meets in New York in September, people will be saying that the MDGs are lagging on many targets and therefore we need to do something to accelerate them. ICT can help. The broadband initiative recognises the critical importance broadband networks will have in delivering the key services—communications, energy, transport, environmental protection, health care—on which all modern societies will depend.

In the 21st century, broadband networks are basically national infrastructures, just like transport, energy and water networks. Put simply, in the 21st century, the social and economic development of every nation will depend on ubiquitous and affordable broadband access. We have broadband access in many countries now and, unfortunately, there is a huge gap in terms of the coverage to monthly income ratio for a country. We want to make sure that national broadband networks deliver benefits across the whole of society, which will make them incredibly cost effective, especially when you look at the savings across multiple sectors. Recent research suggests that savings of less than 2% in key sectors over a 10-year period—or just 3% to 4% in health care alone—could cover the entire cost of rolling out advanced broadband networks to every home in developed countries. Countries need a national broadband vision that can be driven by leaders at the highest level. We have been encouraging political leaders around the world to have their political vision include this idea.

The ITU is only involved in the infrastructure part of the broadband initiative, but the content part is equally important. When you're talking about broadband, you're talking about the last stage where infrastructure meets content. Together with the Director General of UNESCO, I have launched a broadband commission on digital development, which will be co-chaired by President Kagame of Rwanda and Carlos Slim of Mexico. The president of UNESCO and I will be the two vice-chairs and the commission will comprise a range of leading figures from across the ICT industry and other key social and economic sectors, including education and culture, so that we can have a global framework to present to the UN Secretary-General in September.

Communications Review:
As publicly owned companies, telcos have to focus on returns for their shareholders. It seems that governments and super-national bodies have a role to play in trying to encourage the telcos to invest in these areas.

Touré: Absolutely. That is exactly how Silicon Valley was created. Government has to push the first dollars into the right services and applications so that the private sector can grow. There's no question about it. However, you need the regulatory framework; you need some government services that will be the catalyst to start services and get everything going; you need to develop content. When you're talking about broadband, content is the driver. Governments have to be involved in stimulating content creation at the local level and can only do that through e-services, such as eHealth or e-education. Those will generate content.

Communications Review:
Broadband networks are already being actively rolled out in many countries, so why does the ITU need to take a role here?

Touré: It's true that a growing number of countries are prioritising broadband now; that's what we've been advocating. At the moment, few people have recognised the truly transformational power of these networks and that's where

we are concentrating. Most of the world still thinks of broadband as related to the speed at which we can surf the Web. But we are now talking about human-to-human communications, human-to-machine communications and machine-to-machine communications. That's a very important change and therefore we need to have the right policy, regulatory framework and strategy as a catalyst.

Most countries leave broadband rollout to national communication ministries and market forces, but until these networks become ubiquitous and affordable, they will never deliver on their promises. I believe that broadband needs to move to the top of every country's national agenda, with rollout actively promoted, just as the rollout of electricity networks was some 100 years ago.

We have encouraging signs. During the financial crisis many countries, including the United States, rolled out a national broadband plan. Two-thirds of new jobs in the world have been created in the ICT sector over the past five years. This is another opportunity that broadband will create. That's why we believe it's timely for us to move in this direction.

Communications Review:
It takes on a momentum of its own because as broadband is rolled out and used in a more ubiquitous way, then more and more services spin off the back of that and it creates further innovation.

Touré: Innovation is the key word here and the thing is that innovation is limitless. We've seen that it is driven by the human brain—and that power is unlimited.

This brings us to the next thing that you need for broadband plans to succeed. Not only good government policy and a regulatory framework, you need capacity building and education in that field. Some countries, like South Korea, have succeeded in putting the right framework in place for broadband, in educating industry players, engineers and marketing people as well as educating end users and government agencies. They have targeted specific layers of society—the elderly, women, the handicapped, children—and have been very successful. That's why they're number one in broadband today.

Communications Review:
You were saying that education in communications can contribute greatly to helping those in remote and rural areas. Are there initiatives or countries that you think are good examples for others?

Touré: There are many. When we did the latest ICT index classification, we added education as a key element for comparing countries. Norway and Sweden come very high at the top of the index, and there are some developing countries like Rwanda that have also done marvellously well. In Rwanda, the Kigali Institute of Science & Technology was originally a military base that has been transformed by President Kagame into a university. Initiatives like this are very good examples of how people can invest in human power. Also in Rwanda, some of their citizens went to Silicon Valley and are now coming back home and creating their own businesses. This is what we need to do around the world.

The ITU's funding is generally seed funding, of which we have contributed more than US$10 million. We probably fund 10-20% of any project, bringing in the first dollars that are needed to attract other investors. We have a number of initiatives in the ITU because capacity building is one of the key programmes of our development sector. The ITU-D (the ITU Telecommunication Development Sector) is streamlining its extensive ICT skills development through ITU Academy initiatives. The vision of ITU Academy is to strength the human, institutional and organisational capacity of developing countries by making available ICT learning and development opportunities at the highest quality level possible. We have a network of more than 60 Centres of Excellence and ICT Internet Training Centres that deliver education. We've been very successful in providing continuing education to senior ICT managers in both public and private sectors, through face-to-face or distance learning. The centres also serve as regional focal points for professional development, research or knowledge sharing for specialised training or private company use.

Complementing the Centres of Excellence, our Internet Training Centre's initiative is helping developing countries build their own pool of new economy professionals who will drive ongoing ICT growth at the top levels. One example is the Cisco Academies, which we have built together with Cisco in many countries. It's been a tremendous partnership. We have over 80 ICT centres in more than 60 countries now, primarily in less-developed countries. We're trying

to bridge the standardisation gap with rich, industrialised countries. I'm encouraging more and more developing countries to jump in and learn, to help them accelerate and make the right decisions at home.

Communications Review: You've said that high-speed access is a two-sided coin, that with always-on connectivity come security risks. You've even raised the spectre of cyber war. Do you see a growing level of threat and what do you think needs to be done to ensure our networks are safe?

Touré: I believe that cyber security is one of the greatest challenges that humanity is facing. Given the importance of our access to information and communication technology, the safety of our networks becomes a high priority. Cyber crime is on the rise and it's placing a huge burden on governments and the industry alike. In fact, the CEO for McAfee recently estimated that cyber crime is worth over $100 billion annually, which is more than the total value of the global illegal trade in drugs. This emphasises how important cyber security is becoming.

I hope I'm wrong, but a next world war may well start on the Net, in cyberspace. Cyber war is not occurring right now, but some nation states are preparing themselves for it, and that's unfortunate. Cyber threats can reach parts of a nation that physical threats cannot. Attacks on critical infrastructure can stall a country's progress and quickly cause civil unrest. Cyberspace is driven by innovation and, unfortunately, the concept of a super power no longer exists in the way it did before; every individual on the planet can be a potential super power and can make an attack that can be lethal. Cyber threats have to be taken very seriously and that's why we urgently need to put in place a platform for global cooperation and coordination.

In 2007, in my first year as Secretary-General, I put into place what I call the Global Cybersecurity Agenda (GCA). I had a team comprising the key cyber security experts from top companies around the world, both private and public sector, and they came out with a recommendation for five areas. One is a legal and regulatory framework, including the ethical side of cyber crime. We need to have a common understanding of those issues because, unfortunately, due to cultural differences, sometimes crime is defined differently in different countries. Second is the technical arena. Of course there are always technical tools to fight criminals, but criminals are using technical innovation to do more sophisticated crimes and that's how cyber threat technology actually evolves; it's the fight between good and evil. Fortunately, good always wins in the end, but we have to work very hard.

The third area is coordination at the national level. Cyber crime is an international issue but, at the national level, you can have many ministries dealing with it—the Ministries of Defence, Health, Education, Economy all have cyber threats and you don't want them to be dealing with those threats alone. You want to do it in a coordinated manner, so we're encouraging a national coordination of cyber security. The fourth key area is capacity-building on the technical, legal and ethical sides. The fifth area is international cooperation.

The international framework of cooperation is an opportunity for the ITU—with 191 member states and over 700 private companies. As host to the international discussions on this aspect, I'm finding areas where we can agree, recognising areas where we have different viewpoints and seeing how we can bring in all stakeholders together to move this agenda. We need to have a global cyber arms treaty one day and such a treaty will bring together not only governments but all stakeholders, including the private sector and civilians. A key issue is, are governments ready to sit around the same table with the private sector? That is the challenge that we are facing.

We've been talking about the potential of cyber wars and therefore we need to talk about the concept of cyber peace as well. A peace concept before a war is unusual, yes, but it needs the cooperation of all stakeholders. This is the biggest challenge we're facing but it's critical that we work together as nations to prevent a major attack, rather than waiting until it happens.

The worst computer virus so far was the ILOVEYOU worm, made by someone back in 2000 using a laptop that cost less than $1,000. That's scary, and the fact that we are giving access to the Internet to our children in the safety of their bedrooms or the safety of their classrooms, means we need to protect them. To me, children are our most common denominator, an area to start with. In 2008, I launched an initiative called COP, Child Online Protection, to bring all players together. A framework for cyber crime will help us to have an

international framework where we can commit ourselves not to attack each other, commit our countries not to harbour terrorists, and commit to protect our citizens. These are the three prerequisites that we need in order to move this thing forward.

Communications Review: Mobile health is one of the areas where new applications are starting to develop and in which companies are investing more resources. How do you see this developing in remote and rural areas, where it could have the biggest impact?

Touré: The first decade of the millennium was dominated by mobile growth, and we're going to reach the five billion subscriber mark this year. Mobile has been a tremendous success. The second decade of the millennium will be dominated by broadband, not only fixed broadband but mobile broadband in particular. This is why the applications that we have seen in the health, banking and education sectors will be the killer applications of the next decade.

Take SMS messages. Last year, there were an incredible five trillion SMS messages sent globally, which means almost 10 million text messages being sent every single minute of every hour and every day. When we reach the five billion mobile subscription mark, around 20% of these will have broadband access. I'm talking about mobile penetration even in developing countries, which are often above 50% penetration now. The ubiquity of mobile devices around the globe today is opening up a whole new world of opportunities.

In the area of mobile health, we hear a great deal about how we will soon be able to use the latest smartphones to access all sorts of advanced health care applications. I was recently in Bangladesh where I saw applications at the Ministry of Health. One application was a remote diagnosis to a rural area from a medical doctor in the capital city who was linked up from Sydney. It was tremendously refreshing to see that developing countries are designing their own programmes successfully. Other examples include sending reminder messages to patient phones when they have a medical appointment or when they need a pre-natal check-up, or using SMS messages to deliver instructions on when and how to take complex medications such as anti-virals or vaccines. These are applications that will really help developing countries meet their MDGs.

In addition to the easy access, the affordability component of mobile is very important in health because you can have access to medical specialists without having to pay the costs of travel, without having to pay the cost of expensive facilities, without leaving your own town. These are tremendous benefits that eHealth will bring to the world.

Communications Review: You get the indirect benefit, too, with health and education. As the health of the nation improves, literacy rates improve, productivity improves and the GDP grows, so there is more money to invest.

Touré: Absolutely. Education is the bottom line. I always tell governments, don't try to look for the direct financial profitability in education, you have to invest. In Senegal, President Wade has put one third of his national budget into education. I predict that Senegal will be the Singapore or the Korea of Africa in five years' time.

We need somewhere like that in Africa to drive this type of growth. The ITU has been working with many countries in Africa, because Africa is in need of help. We're looking for leaders who have a clear vision of where they want to go and we will help them move in that direction by putting the right policy and regulatory framework in place. This is why we've seen tremendous growth in Africa over the past five years. In fact, in terms of mobile growth, Africa was number one for five years in a row. That's good news. There would not be that type of growth without a good regulatory framework. Forty-five of the 52 countries in Africa have independent regulatory authorities that are putting the right regulatory frameworks in place. They're debating and exchanging views with the rest of the world. We are putting everyone on the same level. The issues that Africa is tackling are new to everyone: voice over IP, connectivity, interconnection, new services and applications. Africa is giving itself the rare opportunity to leapfrog and I believe that by putting the right capacity- building, education and investment in place, you will give the private sector opportunities to invest and make profits.

Instead of technology being one way—from developed countries into developing countries—we're starting to see things like mobile banking originating in the developing world and being taken up by the developed world. Mobile banking is a great example of local solutions to local problems. People wanting to transfer small amounts of money, like $5, could not do that through the traditional banking system so they had to come up with a solution, and it works. This is creating the next generation of bank account

holders. By transferring $5 by mobile phone periodically, you eventually reach $100 or $200, and then you may as well just go and open a bank account. That's what is happening now and it has not been a threat to the banking industry.

There's such a strong tradition of entrepreneurship in developing countries because people have had to come up with solutions to get around the problems they face. I think that technology is going to allow them to unleash that entrepreneurial spirit in a way that we haven't seen yet.

ICT is an area where many developing countries will now start growing because it is not tied to aid. I have very strong views on aid. I'm not pro aid: I'm for good business environments and profit making. In ICT, we don't need charity. This sector can grow if we have the right regulatory and policy framework. If an investor can make profit in a country, he will reinvest it and make more profit and in the process he will create jobs and develop new services and applications, and wealth will be created. That is what we're looking for and the message appeals to politicians who see the next generation of their voters getting jobs and being happy, therefore it is a win for everybody.

Communications Review: You have a captive audience among our readers, who all play a part in the communications value chain. What would you request of them in support of the ITU's flagship programmes?

Touré: I believe in the power of collaboration. Working together we can achieve so much and that's one of the things that I've been advocating. Deployment of broadband networks will be a winner for governments, consumers, operators, manufacturers, software developers—everyone.

It's important to note that the security threat should not overshadow the benefits of the cyber world. We cannot use cyber security as a means to cut off citizens from the Net. People have the right to communicate. It's a basic human right. Every citizen of this planet has the right to access information, to use information, to create information and to share information. That's the prerequisite for us to enter the knowledge society that we're dreaming of now.

Dr. Hamadoun Touré is the Secretary-General of the ITU. Born in Mali in 1953, Dr. Touré holds advanced degrees in electrical engineering from universities in St. Petersburg and Moscow.

A veteran of the satellite industry, he spent many years with Intelsat, where he rose to the role of Group Director for Africa and the Middle East, before joining ICO Global Communications as African Regional General Manager. He became an elected official of the ITU in 1998, serving as Director of the Telecommunication Development Bureau until 2006.

He was elected Secretary-General at the ITU Plenipotentiary Conference in Antalya, Turkey, in November 2006, and took office on 1 January 2007.

For more information, visit the organisation's website at www.itu.int.

An interview with:
Jean-François Cazenave Télécoms Sans Frontières

It is safe to say that most people who have access to telecommunications services and have integrated them into their daily lives have come to take them for granted. In all developed countries, mobile and fixed networks reach the majority of the population, and in many developing nations mobile coverage is starting to fill the gaps between the connected and the unconnected. Today, whenever you need to call or text someone, you can.

However, that's not always the case after a natural disaster or a civil disruption or a war. The value of communicating in these emergencies is critical to the rescue, survival and redevelopment efforts of those countries and people affected. For 12 years, Télécoms Sans Frontières (TSF) has been providing free, reliable emergency telecommunications services to citizens, governments, and humanitarian relief workers and organisations. Here, co-founder and president, Jean-François Cazenave, discusses how the organisation came to be and the importance of telecoms in responding to and helping prevent disasters.

Communications Review: TSF celebrates its 12th anniversary this year. Can you give us some background about how the organisation has developed over this time?

Cazenave: Our first humanitarian operations were in 1991 during the first Gulf War and at the start of the Croatian war, and 1992-1997 during the Bosnia-Herzegovina war. All of these operations involved providing aid in the form of food, hygiene products and the like.

One recurring event that concerned us throughout these years of general humanitarian efforts was that, each time we left a camp, there were always refugees who took out from their shoes a piece of paper containing a telephone number. They would say, when you're back in France, please call our family in Germany, the United States or wherever, and please tell them that we are alive, that a particular cousin is dead or something similar. It was the same in every location—Kurdistan, Bosnia, Croatia, Iraq, Peru—they took these telephone numbers out of their shoes. That's the way to pass through security check-points because they search your pockets but they don't search your shoes.

It was then an idea crossed my mind: there was a need for people in these horrific situations to communicate. We leased our first satellite case and in June 1998, when Milošević had taken Kosovo, we made our first humanitarian trip with the intention of providing communications for those affected. Part of the western Kosovo region was on fire and the refugees were crossing the border during the night. We set up a site some 200 kilometres north of Tirana, near the Kosovo border, and during the night the refugees were crossing the countryside. Instead of going to a food distribution centre or to a medical care post, they came directly to our telephone site. They began to call Germany, France, the UK, etc. We were still there 10 days later and we saw German, English, French cars full of people coming to look for their relatives. It was said there that we had invented the humanitarian telephone system. We filed the Articles of Association of Télécoms Sans Frontières shortly thereafter.

Nothing more happened until 1999. In April 1999, Milošević decided to expel one million people from Kosovo. Three of us from Télécoms Sans Frontières set up on the Macedonian border, approximately three kilometres from the city of Skopje near the Kosovo border. We arrived at a camp controlled by the French army and installed by the French consul. Four days later there were 25,000 of us in the camp and a queue formed, two kilometres long, where people waited two nights and one day to get to the TSF satellite line.

This attracted much media attention—CNN, CBS, TF1, France 3, France 2, the BBC. Bernard Kouchner [*editor's note: the French Minister of State for Health at the time*] saw us on CNN and he immediately released approximately €200,000. Then we bought a whole set of satellite line equipment and generator sets, and that's how the operation was launched.

We stayed until September, when we'd exhausted our funds. As we were about to leave, the High Commissioner of Refugees [HCR] came to see us and offered to finance us to support the Serbian enclaves throughout the winter of 1999-2000. That plan was implemented by the HCR to ensure that these refugees could, quite simply, maintain a link in their villages and not leave their families, but remain in Serbia or in Albania. When we were getting ready to leave Mitrovica, there was an earthquake so we deployed our equipment for 10 days to support the emergency services. From this we found there was a need for emergency services during natural catastrophes as well.

In December 1999, we did not have much money so we went to see Michael Storey, the chairman of Inmarsat at the time, and we asked him for 500,000 francs to fund operations. He thought that the work we were doing was fantastic and it brought a considerable amount of revenue to Inmarsat because it was creating traffic. As part of the funding, Inmarsat asked that we expand our services throughout the world. We signed a partnership agreement for one million francs a year for three years. Inmarsat is, of course, still our partner. And that's how TSF took off.

By 2001, we had supported a lot of countries with the HCR: natural catastrophes in Italy, in Peru, the earthquake in El Salvador. In 2001, during the war in Afghanistan, the first satellite link via Internet was proposed by Inmarsat, who immediately sought us out. We had an 18 kilogram unit allowing us to obtain a 64KB connection; slow, but it could be used to gain access to sites, send reports, etc. We had reached a significant point in our operations because this link was available to our people and our services in Mazar-i-Sharif in Afghanistan to create our first Internet centre.

In 2003, we entered Baghdad with the American forces and opened an Internet centre there for 70 non-governmental organisations [NGOs] who frequented our centre daily; this was in addition to the humanitarian telephony operations that we were still doing. After this, we became the first telecommunications partner of the European Commission and then came under European financing. In the meantime, other operators joined us, including Vodafone Foundation, United Nations Foundation, Inmarsat, Vizada, AT&T, Cable & Wireless Worldwide, PCCW, Eutelsat and the governments of the Aquitaine region and Pau, France. In 2006, the United Nations joined us and gave us special status which means we are responsible for managing the first 30 days of a crisis to help the UN and all humanitarian agencies on a site. We are the only international telecom NGO in the world.

In terms of a catastrophe, once we arrive on the tarmac at the airport we are immediately transported by helicopter to do our work; other aid groups stay behind. We have an official mandate from the United Nations because we provide our support to UNDAC [United Nations Disaster Assessment and Coordination] which is the team responsible for assessments. Why? Because to understand a situation and inform Médecins Sans Frontières (MSF), Oxfam or other aid organisations, a preliminary evaluation is required to determine where to go, what to take, and this assessment can only be transmitted by Télécoms Sans Frontières. You can do nothing without telecommunications today. What's the point in sending food to such-and-such a village if the people need medicines and not food?

Since 1999, we have operated in 56 countries throughout the world.

Communications Review: In terms of financing for your projects, you have private partners, such as Inmarsat and AT&T, and also public financing. What is your annual operating budget?

Cazenave: It varies from €2-3 million a year, depending on the crises. We chose to have business partners because we had difficulty making humanitarian organisations understand the importance of communications. Seven or eight years ago, humanitarian organisations were about food or medical treatment, but today that has changed considerably.

All our partners finance the annual recurrent costs of TSF. Some of the funds from donor suppliers are used to pay salaries and for airline tickets and telephone communications.

On the equipment side, we generally refuse donations from telecoms and other companies. There is a temptation for telecommunications operators to donate stuff they no longer need, that we find unsuitable for the terrain and which, honestly, should be sent directly to the scrap yard. We have supplier relationships with a few organisations, including Vizada, AT&T and Inmarsat, who are our partners and they donate equipment that we use on missions.

It's important for us to be financed firstly and above all in respect to the infrastructure; without that, everything collapses. Emergency funding is different. When I send a proposal to the European Commission, within 24 hours I have the funds. But I need funds to deploy and take off from my three bases in under three hours; I need the capacity to spend €300,000 on satellite communications, aircraft costs, etc. That's what I need and that's what I have. But if I had a lot more money, I could deploy a lot more people.

In Haiti, there are sites where people only got access to the telephone after 15 days. If there had been more of us on site, if we'd had a logistics manager dealing only with accounting, and one only managing vehicle hire agreements, and so forth, we could have been a lot more effective. We are effective with the resources we have for providing specifically targeted actions in terms of a common service, but we could have gained a lot more ground with

more resources. In 43 days we covered 60,000 people in terms of telecommunications in the affected zone of Haiti. We had four vehicles, telephone operators and translators. We helped 10,500 families but there are still people needing help and we need more resources.

We need equipment and people. It's not normal to have people work 17 hours a day for 43 days. We are obliged to repatriate them because they are exhausted, which happened with two people recently in Haiti.

Communications Review: Do you get any revenue from your efforts?

Cazenave: No, everything is free for the benefit of the entire humanitarian community: for local authorities, NGOs and local people. Everything is entirely free. In Haiti, more than 100 international NGOs, UN agencies and local authorities have benefited from our services.

Communications Review: Can you describe the structure of the organisation and employees? How many full time employees do you have and how do you recruit volunteers?

Cazenave: After our experience in Baghdad in 2003, we realised that it was absolutely necessary to get to sites quickly, and all our partners said that we should pre-position ourselves in areas vulnerable to natural catastrophes. We chose two bases: 1) Managua, covering all Latin America, the Caribbean and Central America; and 2) Bangkok, managing South-East Asia, the Pacific and East Africa. We have French or English expatriates who are permanently there, along with volunteers who are consultants operating in their geographical area. Since 2003, we've been able to get to a disaster site within 24 hours.

Pau, France, is our international headquarters. In Bangkok we are on the site of the Asian Institute of Technology, which allows us to have students (masters to doctorate level) in telecommunications and network IT operations, who are trained each year by TSF and who operate alongside us on the missions. The interest here lies in helping them to pay for their studies. For example, students at the Institut National des Télécommunications in Evry go through TSF training and must be ready to take off at any time to a natural catastrophe or a war zone. They offer availability and in return we pay their airfare, expenses and a salary while they are on a mission. We call them consultants; it's not volunteer work. We always take people with us on missions who are nationals of that particular geographical zone. When we operated with the deluge of refugees in Pakistan in March-June 2009, we took Pakistanis with us on the mission. If we have a mission to Sri Lanka, we take Sri Lankans with us.

We have 22 full-time consultants and, in total, potentially 50 people, including the students, can be on each mission. In Pau there are 15 of us. All the management, communications, administration and financial accounting etc., are in Pau. It is also the base for everything that happens in West Africa, Europe and overall reinforcements. If something happens in the Philippines, the Bangkok base will go but it will get reinforcements from Pau within two days.

We maintain a full-time 24-hour watch, taking into account the time zone differences. When we got news of the earthquake in Haiti, I was at the Managua base at that time. Managua got the news at 5pm; it was almost midnight in France. People in France woke up to learn the news, but we had already left Managua. We are set up for take-off within three hours from any of our bases.

Communications Review: When you respond to a disaster, what type of interactions do you have with local telecommunications organisations?

Cazenave: There are three possibilities that we encounter in a disaster: 1) the network has been destroyed, which was the case in Haiti; 2) there isn't a connection and we're in the middle of nowhere, which was the case with Indonesia; or 3) the network is saturated, as in the case of the AZF plant in Toulouse, because GSM does not differentiate between who's calling whom to prioritise transmissions.

We are always working with local operators. As soon as we are able, we go onto the local network. We supply GSM phones; we buy SIM cards and supply the NGOs. As soon as we can, we use the local network, but it's always well after we've established our initial satellite communications.

Communications Review: Can the telecom industry provide you with innovation in terms of service, terminals and new systems, in order to progress. Are there needs which have not been satisfied?

Cazenave: Each time a new product comes out all the partners of that organisation try to be the first to get it. Inmarsat is in the process of bringing out a new portable product, which I think we will be the first to have at ground level. Eutelsat is also making considerable efforts, such as providing us with antennae in Haiti. Both partners have done some marvellous things.

What we need is to establish a mobile connection with a higher transmission speed. We had 150 users on a BGAN [broadband global area network] in Haiti, with a 492 kbps connection. We had 15 humanitarian workers on this one modem. If we had twice the speed, we could get 30 people using it.

In the BGAN, you can open up Inmarsat connections because the equipment weighs three kilograms. It takes four to five minutes to open it and connect it to the satellite. Then you can have about 15 people using it. However, because of the size and ability to make a quick connection, when we arrive in an area, the assessment teams leave with that equipment. A VSAT [very small aperture terminal], which is going to open up a connection several times, is 10 times more significant but weighs 200 kilograms and takes us half a day to open. But the VSAT will be far more significant because we are going to open it in the heart of the emergency coordination centre once things are a little more structured.

So there are two tools we need on missions. One enables very quick and light deployments, and to send and receive transmissions costs between US$3.50 to $5.00 a megabyte. With a VSAT, you pay a monthly subscription and can operate it insofar as it can respond. The cost is not the same nor is the work. We want more bandwidth and portability. The quicker it's deployed at ground level, the more effective it will be and the more we'll deploy.

Communications Review: In addition to the humanitarian work, you mentioned disaster prevention programmes. Can you describe this area of work in more detail?

Cazenave: After a disaster, it's a question of asking how we can improve things the next time, for example, in terms of what to do during the first 24 hours in which we are not there. It's a question of carrying out studies with civil security services at the local level, explaining how to install the equipment, training local emergency operators in the use of our equipment, providing them with the resources, equipment dispatch procedures, etc., and rendering the equipment operational. The European Commission wants to order a study on Haiti from us and we're currently doing one in the Philippines, following Tropical Storm Ketsana, which affected the northern area of the Philippines, including Manila.

We are training 40 international NGOs, 20 in Bangkok and 20 in Managua, in emergency telecommunications. In both locations we're training MDM [Médecins du Monde], MSF and some international NGOs. We're going to open a training centre in Dakar, Senegal, in September which will cover all the countries of the Sahel region. We will do a pre-positioning of equipment in addition to training there. In the Philippines, we bought equipment with European funds, and then trained the locals and the equipment stayed with them. In another operation, the international NGOs already have the equipment, so we are instructing them on how to optimise it.

Prevention goes beyond these things. In July 2005, we met up with Médecins Sans Frontières in Niger. They were working in the poorest zone of the country, a village called Dakoro, which had just experienced an acute food crisis, a famine with adults who were dying and a very high mortality rate among the children. There are indicators to anticipate a crisis in remote areas and enclaves such as Niger. These indicators are recorded by the government representatives for the villages, such as vets, teachers and so forth. An indicator file comprises measurements of childrens' forearms taken by the teachers every month, the number of cows which have died, in short, various indicators which mean that a zone can be given an amber status. When they're on amber status, the world food programmes will arrive immediately. The problem is that these first-rate files arrive by bicycle, on the back of a donkey, by sea, on a bus, sometimes never or, sometimes, simply too late. Between 2005 and 2008, we put satellite terminals into Niger to make the transmission of this data quicker and trained the local teachers and vets to use them. Now, the data arrives directly from a central computer in Niamey and puts the zone on alert within two minutes. We are currently protecting 11 million people with this programme.

We are opening, in collaboration with the association IT CUP, community telecommunications centres in the most remote areas of the world, such as the Burma border, Nicaragua, Niger and Burkina-Faso. We are

providing trainers who will remain there for a year and who are going to work with local radio. These places receive no information and these centres will enable them to broadcast messages. The local school which has no books will now have access to the most beautiful library in the world, which is the Internet. Small-scale farmers, who were being conned because they lacked knowledge vis-à-vis people coming to buy, will be able to get better prices because they can have access to daily prices in other cities. So, in that respect, in communities of 10,000 people, an entire economy can be launched, an entire education system, weather forecasting, disaster prevention, local radio and the small human rights organisations—everything is possible with communications.

Jean-François Cazenave is the president of Télécoms Sans Frontières (TSF), which he co-founded in 1998.

Before dedicating his life to TSF, Mr. Cazenave founded two other traditional humanitarian organisations. At TSF, he has provided humanitarian calling operations and telecommunications support to NGOs and UN agencies in Kosovo (1999), Afghanistan (2001) and Iraq (2003). Since 2003, TSF has responded to all the world's greatest humanitarian crises. Mr. Cazenave has led emergency relief operations for TSF in more than 56 countries worldwide, in support of more than 550 NGOs, rescue parties and UN agencies as well as millions of disaster victims, by providing them with free telephone calls.

Mr. Cazenave has held positions as a civil servant and senior executive at the French public administration of postal services and telecommunications (PTT) and has been president of TSF since May 1999.

For more information, visit the organisation's website at www.tsfi.org.

An interview with:
Dr. Najeeb Al-Shorbaji World Health Organization

Throughout its evolution, telecommunications has radically changed traditional ways of doing business and connecting people, and we have seen many sectors transformed completely by the capabilities and reach of telecoms. One of the sectors positioned to experience the next wave of transformation is health care. Applications for individuals, doctors, hospitals and communities have the potential to dramatically improve health and provision of care globally. Here, Dr. Najeeb Al-Shorbaji, the director of knowledge management and sharing at the World Health Organization, shares his insights into the current success of eHealth initiatives, the challenges and opportunities ahead, and the need for investment to further improve health in remote areas of the world.

Communications Review: Mobile health and telemedicine are areas where new applications are being embraced in various parts of the world and in which communications companies are starting to invest more resources. What do you see as the biggest barriers to advancing health, particularly in remote and rural areas, and where could telemedicine have the biggest impact?

Al-Shorbaji: First, I'd like to clarify these terms as we define them at WHO. We describe terms such as mobile health [m-health], telemedicine, and tele-health as eHealth applications. eHealth was defined by the World Health Assembly Resolution in 2005 as "the use of information and communications technology in health". Mobile health is the use of mobile technology to support health care. Telemedicine can incorporate other technologies, including the Internet, the satellite, the fixed-line telephone or radio. Telemedicine is a much more inclusive concept than mobile health, but eHealth is used by WHO as an umbrella term to cover all these concepts.

Mobile health is not reaching remote or rural areas, which are in real need of these services. Remote places have fewer human resources and facilities to serve their communities and transportation is often difficult. We are trying to promote the concept that instead of making people move to get health services, move health services through better delivery of health information. In that way a doctor or nurse can gain access to resources from centres of excellence located in other places.

There are problems with this, of course. I see infrastructure as one barrier for not achieving the full potential of m-health. Looking at maps of countries in terms of telecommunication infrastructure, many urban areas are better served than rural and remote areas because of sheer numbers of people, which telecommunications operators base their business models on.

The other barrier is financing. People like to invest where there is a faster, more positive return—which is typically not in rural areas. Investment is something that we need to work on. The other barrier is the governance of m-health and its applications. There are numerous legal, ethical and standardisation issues that need to be worked out to allow for more universal access to mobile technology and, as a result, to mobile health services.

Communications Review: Are there any practical examples of initiatives that have taken place either in one region or by one company or in a particular territory that can be a benchmark for others?

Al-Shorbaji: Yes, we have just made an inventory of mobile health projects in Africa. We have identified about 400 projects there, which look at how to deliver health care or how to collect health data from the field.

There are some excellent examples of how mobile phones can help people with tuberculosis [TB]. TB patients have to take their medication at certain times for a specific duration or they risk developing drug resistance. One mobile health application will send an SMS reminding patients when to take their medication. The patients then confirm that they have complied. For those who have problems with diseases such as diabetes, technology can provide advice on diet, exercise and overall lifestyle.

Using the mobile phone to deliver health information in support of health care or to remind patients of their medication or to collect data on health situations requires policies, investment, partnerships and training. One striking example is an application that can help patients to identify whether a medicine is counterfeit. A code provided by a pharmacy can be sent to a database via a mobile phone to allow people to check whether a drug is genuine. Counterfeit drugs are a major issue in Africa and many Asian countries.

There are other examples: in Bangladesh approximately 30 million women are provided with mobile connectivity throughout their pregnancies.

Unfortunately, so many of these mobile health projects are pilots, which run on a limited scale for six months or a year or they are short of funds. We have not come to a stage where a mobile health project is a national one and funding or sustainability is guaranteed for two or three years. We haven't seen many projects in which m-health is integrated into the health care system; it is still something that is done in parallel. What we have seen is that mobile health can improve the quality of health service; it reduces cost of delivery and yet is not fully integrated in health care systems. It can deliver information faster and help patients to get timely, accurate information in collaboration with their health care providers and associated institutions.

Communications Review: What is the extent to which these solutions and services are dependent on literacy? In many parts of the world the people who are most in need of medical support are also illiterate. Are there applications that can be used by anybody?

Al-Shorbaji: Helping people with poor reading skills to get information is a big challenge.

The good news is that researchers and developers from both academia and the private sector are working on this issue. I have seen applications where illiteracy is addressed by using voice messaging. There are also applications that aid people with visual impairment by enlarging the text or using animation or graphics to guide people on matters such as how to take certain drugs.

One of the biggest challenges is to ensure that the knowledge gap in the world is not increased as a result of the digital gap. We want to make technology available in a way that will improve literacy, access to knowledge, the quality of information that people are accessing and in a language that is appropriate to them. We have heard about an application that makes it possible to make a phone call in your language and the person receiving can listen to that message in theirs. The translation process allows people to bridge the language or literacy gap.

I hope that technology companies will consider society in its totality and not deprive any part because access is difficult for them. Software developers need to help communities to bridge the knowledge gap.

Communications Review: Aside from helping to deliver better health care or access to resources, how else can telecommunications companies benefit the health care sector in terms of data gathering and research or in cases of disaster or epidemics? How can telecoms help in those situations?

Al-Shorbaji: According to our global eHealth survey, the most commonly reported m-health initiatives in the world are for emergency and disaster situations, health call centres or help lines, surveillance programmes, and voice and text messages to achieve treatment compliance. A number of countries reported that mobile health was helping with HIV/AIDS treatment and follow-up. M-health involves collecting data and reaching out to communities with high-quality information.

Telecommunications technology is fantastic for data gathering, for surveillance, for epidemiological surveys and the like. However, telecommunications is about two-way communications. It is equally important for technology to be able to send back data that has been analysed so that people can use it to improve health education, health promotion, or for distance learning, tele-consultation, etc. In other words, data collected about people's health through a technology should come back to them as knowledge through appropriate technology.

We have a fantastic example of collaboration between the University Hospital in Geneva, Switzerland and WHO for providing telemedicine in Africa. Fifteen Francophone African countries are provided with services for tele-education, e-learning, second opinion, group discussions, and so forth on a monthly basis using the Internet. One of the major problems in Africa is a lack of doctors, nurses and other health workers. This service—and many other programmes—provide a means of sharing medical knowledge. WHO has been sponsoring a programme called 'Implementing Best Practices Knowledge Gateway'. The concept is simple: create a virtual network of thousands of professionals worldwide to share experience and knowledge and learn from each other.

Around 4.6 billion people have access to a mobile phone and 1.7 billion have access to the Internet. Can the telecommunications sector and other companies develop a more cost-effective and better way of bringing mobile Internet to remote areas? We know that 67 people out of 100 have a mobile. We know that 26 people out of 100 say they have access to the Internet. However, when it comes to Africa, only four percent of the population has access to the Internet. How can we bridge that gap?

Communications Review: One of the challenges is to get the commercial side of eHealth to work. The smartphone devices are expensive. The carrier technology that enables them to work is expensive. Somebody has got to pay for these and the question is, who? Is it international agencies? Is it local government? Is it the telcos or the individuals, who in many cases are in deprived areas and therefore not capable of contributing towards the cost?

Al-Shorbaji: One challenge is to figure out how to reduce the cost of smartphones so they are available to more people. The second challenge is to make them simple to use. We don't all need sophisticated devices. There are many applications that can run on less sophisticated technology. It's a challenge in terms of who will pay for that, but my feeling is that we all have to work together. We have to build a public-private partnership. A target within one of the United Nations' Millennium Development Goals specifically asks for public-private partnerships in the area of information technology and telecommunications. This is not necessarily the responsibility of the government or the private sector, UN agencies, NGOs or donors. It's the responsibility of *everybody* to recognise the need to invest.

Communications Review: What opportunities are there for the WHO to work with communications companies to help advance health care initiatives around the globe? Can we identify priorities and define standards?

Al-Shorbaji: Definitely. One important function that we have is to help countries to set policies and strategies to create the right governance for introducing eHealth or m-health initiatives. This is through standardisation and by building capacity in people. We work with governments to identify their needs and help to resolve them by reaching out to companies, partners or donors. One of the major issues in many countries is that many projects are not linked. There is an absence of a national strategy or a legal framework in many countries. We work with governments and with companies to advise what interoperability standards would provide confidentiality, privacy and data protection for transfer of data from one record to the other, from one hospital to the other and from one region to the other.

What we see in many places is that hospital A has one system, hospital B has another and when a patient is in an emergency in one of the two hospitals, the patient's records are not available. The hospital has to gather patient information again, which is expensive and can result in mistakes. We are advising countries how to assess their needs and ensure that their information systems fit their requirements, rather than bringing in a solution and looking for a problem to match it up to.

Communications Review: The communications and technology industries are innovating all the time. Is there a service or device that currently does not exist that you wish were available to help in health care efforts? Associated with that, are there any people who are demonstrating good behaviours and good ways of working with you that could be replicated elsewhere?

Al-Shorbaji: People ask why the health care sector is late in embracing information technology. I hear people asking why can't we deal with health data in the same way as we deal with the ATM? You go to a machine, insert your card and get your money. But a health transaction is more complicated than financial transactions. It's about individuals—the information collected is more complex and requires different standardisation. It requires a different way of working and a different technological design. We are still short of innovation for health applications that fit health needs. Take the keyboard, for example. It's not designed for doctors. Doctors need a different way of interacting with the computer in which their tasks are supported through technology. Look at relational databases. They are designed basically for finance, or banking, or human resources but not to record health conditions.

How can we improve software and hardware design to reflect the way the health sector works? There are applications like voice recognition,

for example, by which the doctor can dictate a diagnosis or a prescription which then goes into the medical record as a transcript. But somebody has to go back and make sure that there was no misinterpretation. That means additional work. We dream of true innovation in health technology instead of adapting technologies used in other industries. That only comes through investment and research to gain a better understanding of the needs of this user group.

Communications Review: All the major telecommunications companies are publicly owned and they've got obligations to create increasing value for their shareholders. Many of the immediate needs for health care that we've discussed are in markets and for users who simply cannot afford to provide the levels of return that these telcos are demanding. You've spoken much about the need for development of equipment, services, applications that are specific to eHealth and the delivery of services within eHealth. What, in your mind, can be done to resolve this dilemma and bridge the gap and encourage the participation of the telcos?

Al-Shorbaji: I believe strongly that investing in making knowledge and information available to people will help them to become healthier and more productive. Investment in health technology should not be something that we cannot do because it's costly. The long-term return on investment is there; there are savings, improvements and efficiencies. In a citizen-centred health care system, technology is an enabler. Technology companies must understand that they are part of a social-economic movement in terms of improving the quality of life.

Communications Review: Perhaps, in order to get these initiatives going, there need to be investment subsidies or incentives given by governments. After all, governments are the custodians of the local economy and responsible for the welfare of the people within their countries.

Al-Shorbaji: Of course the government has a major role to play. However, I think it is a shared responsibility with the private sector and shareholders. We have to understand collectively what is good for the community and do it. I understand the need of the private sector to make a profit, but I strongly believe that this investment is good for these companies if they do it in a way that supports equity. Many ICT companies have their own philanthropic arm. I hope more of these foundations, and the companies themselves, will recognise their social responsibility to work with governments to make these technologies more affordable, and more accessible.

Dr. Najeeb Al-Shorbaji has been working as director, department of knowledge management and sharing, at the World Health Organization Headquarters (WHO/HQ) in Geneva since September 2008. Prior to that he held the posts of information scientist, regional adviser for health information management and telecommunication and coordinator for knowledge management and sharing for WHO Eastern Mediterranean Region.

Dr. Al-Shorbaji's portfolio covers WHO publishing activities and programmes, library and knowledge networks, eHealth, and WHO Collaborating Centres. He is a member of a number of national and international professional societies and associations specialising in information management and health informatics. He has written over 80 research papers and articles presented at various conferences and published in professional journals. Dr. Al-Shorbaji has held a PhD in information sciences since 1986.

For more information, visit the organisation's website at www.who.int.

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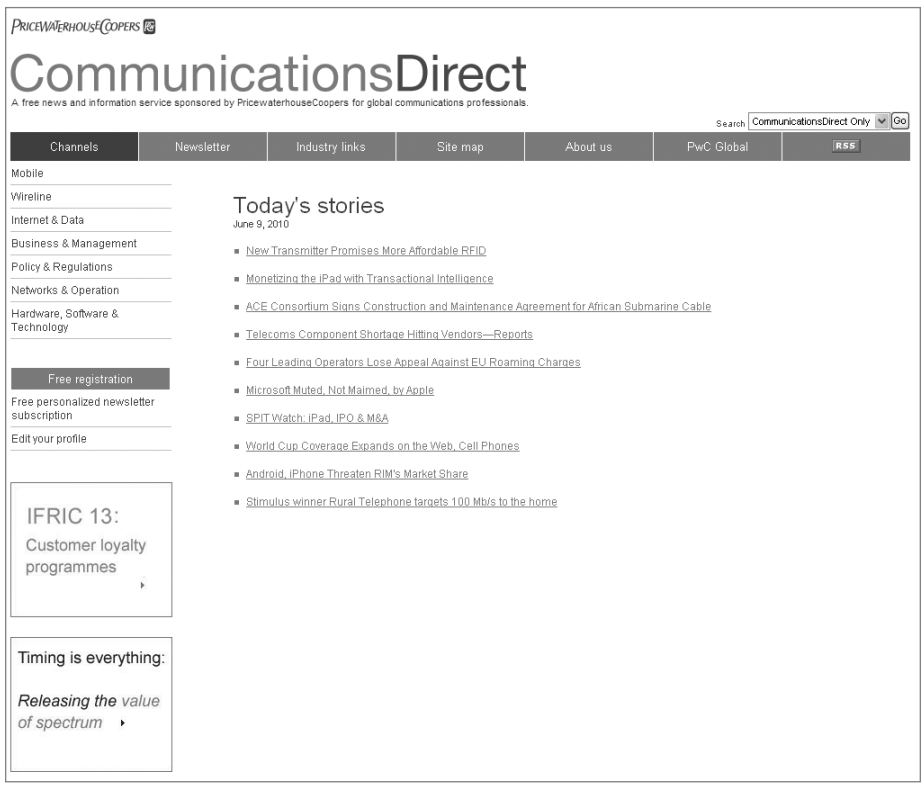

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