Connected Workforce

Thought Leaders

Essays from innovators in business mobility

Edited by Simon Aspinall and Anja Jacquin Langer

True employee mobility – creation of a virtual workplace wherever we happen to be – may signal the biggest change in working practices since the industrial revolution. Organisations are already seeing benefits from instantly distributing information when, where and to whom it is needed. A few are restructuring more fundamentally, embedding knowledge directly into new streamlined business processes. Telecommunications providers are also investing heavily behind the scenes to secure and personalise the huge volumes of content available wirelessly to a workforce on the move.

'This book makes an important contribution to understanding the true potential of mobile technologies in the workplace. It demonstrates clearly that mobile applications are "real".'

DR. DAVID R. DEAN, SENIOR VICE PRESIDENT AND DIRECTOR, GLOBAL PRACTICE AREA LEADER, TECHNOLOGY & COMMUNICATIONS PRACTICE, THE BOSTON CONSULTING GROUP

'A fascinating book. It shows the workforce as an environment of connected intelligence, where mobility changes the rules.'

DERRICK DE KERCKHOVE, DIRECTOR, THE MCLUHAN PROGRAM IN CULTURE AND TECHNOLOGY, UNIVERSITY OF TORONTO AND HOLDER OF THE PAPAMARKOU CHAIR IN EDUCATION AND TECHNOLOGY AT THE JOHN W. KLUGE CENTER AT THE LIBRARY OF CONGRESS, WASHINGTON DC

In **Connected Workforce** editors Anja Jacquin Langer and Simon Aspinall explore how this revolution is gathering pace. They bring together case studies and perspectives from senior business executives, industry visionaries, and innovative service providers whose solutions will affect us all.

Cisco Systems

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The Cisco© Internet Business Solutions Group (IBSG) helps customers transform their business, organisations and institutions, create new services, and drive industry-leading change through the use of technology and process innovation. IBSG consultants offer a unique combination of in-depth industry, business and technical knowledge.

Cisco's IBSG Service Provider team works with the leading mobile service providers worldwide. The team is responsible for leading Cisco's customer partnerships with mobile service providers, identifying, developing and delivering new business opportunities across the mobile, service provider, corporate and consumer sectors. The IBSG team assists operators in entering new markets, achieving operational improvements, addressing new customer segments, launching new services and products and developing channels to market.

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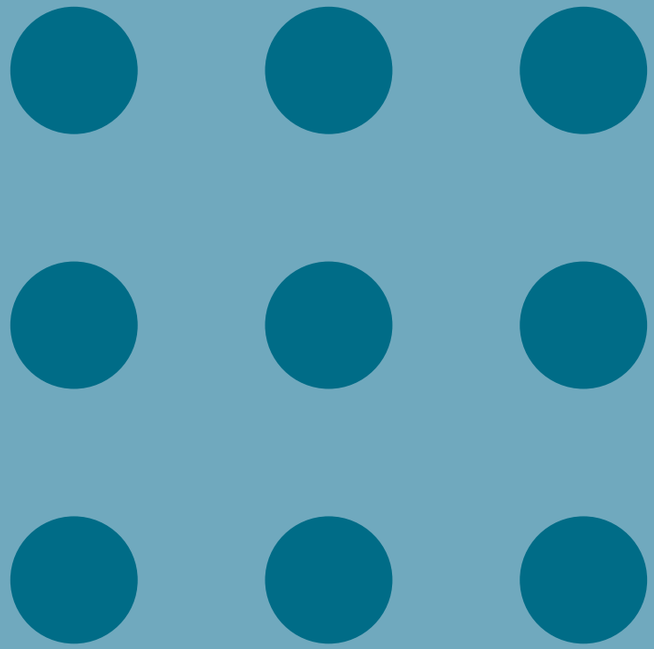

Introduction

Anja Jacquin Langer | Mobile Advisor, IBSG EMEA, Cisco Systems
Simon Aspinall | Director of IBSG Mobile, Cisco Systems

The importance of mobility

Mobility has been critical to man's survival since the beginning of history. When Ice Age glaciers moved across Eurasia and America 16,000 years ago, they drove tribes of Cro-magnon cavemen south and only those who adapted to their new environment survived. Since man began riding horses some 1,000 years BC, the more mobile civilisations were able to rapidly expand their lands and influence. The Huns, for instance, overran the Chinese empire in the 4th century AD. Then, in the 17th century, transatlantic sea-faring enabled the Spanish Conquistadors to conquer the Americas. Two centuries later, the British Empire spanned the globe supported by sea-borne trade and weapons.

Society evolved again during the Industrial Age with the invention of telecommunications using semaphores, telegraphs and later telephones. As trade and information accelerated, the world shrank further. In the 20th century, technology enabled society to make geographical distances between people increasingly irrelevant. Today, our ability to communicate without the need for a physical connection is opening whole new opportunities for both society and business. Mobility allows people to communicate regardless of their location: opening new markets, offering alternative ways of working, and fundamentally changing the face of business.

This collection of essays brings together the views of senior business leaders and renowned market innovators on how mobility is changing their business and work practices, as well as how mobility is shaping our future.

The rapid rise of mobility

The rate at which mobile telecommunications technology has changed over the past 20 years has been breathtaking. It's easy to forget that just two decades ago, personal mobile phones were a futuristic vision. Since then, the mobile phone market has rapidly evolved from addressing specialist corporate users into a mass market phenomenon with over 1.6 billion subscribers worldwide. Mobile phones have become an indispensable communications tool around the world – even helping change the fortune of some of the poorest, least advantaged societies.

The rapid evolution of mobile technologies has significantly expanded what's possible while on the move. Initially, voice services drove the expansion of the mobile market. Over the past five years, voice has been joined by both data and video services, greatly enhancing the potential of mobility. As an example, mobile data services began when a small number of mobile phone users started sending typed messages on their phones. With an estimated 23 billion SMS text messages sent in 2004, this trend has become a worldwide business.

The productivity benefits of corporate networking are well known. With the invention of broadband technologies such as DSL, corporate networks have been extended into remote offices and even to the home. More recently, fast cellular and wireless LAN technologies have freed data services from the shackles of a wired connection. Voice, video and data services are now available to users where and whenever they need them, across a wide range of technologies (CDMA, GSM, 3G, WLAN, DSL, ethernet…) and devices (phones, PDAs, PCs, tablet PCs, tailored devices).

The market for mobility solutions is enormous. IDC predicts that companies will spend €50 billion on mobility over the next three years – with an annual growth rate estimated at over 40 per cent. Such rapid growth will have profound implications for businesses, in terms of how they operate and conduct business with their suppliers and customers.

Drivers of the mobility revolution

Five main factors will drive the expansion of mobility in the business sector:

- Businesses (and individuals) like to communicate on the move
- Mobility increases corporate productivity and competitiveness
- Broadband mobile devices, technologies and services are coming of age
- Personal nature of mobility shifts communication from a number to an individual
- Digital information and content are increasingly pervasive

It is a fact of life that people want to move and be able to communicate at the same time. As Mauro Sentinelli, Deputy Chairman of the GSM Association and the former Managing Director of Telecom Italia Mobile, asks, 'Would you like to have an office which, instead of being just 16 square metres, is the entire world?' Mobility allows exactly that. For the individual, mobility means more flexible working with the ability to connect to and communicate with work colleagues, suppliers and customers wherever they are in the world,

whenever they need to. The fundamental nature of business is exchange and trade between different groups. Mobility allows businesses to collect, manage and trade information, exchange goods and services even more rapidly from a greater range of places. Mobility also greatly expands the reach of a business – to reach more customers, more conveniently. Together, these effects mean that mobility can significantly boost productivity and deliver considerable competitive edge.

> 'The most sustainable advantage will be achieved by those organisations that also change their business model and processes to embrace mobility.'

As the most innovative companies adopt mobility solutions, the benefits which they experience will entice other companies to follow suit. Mobility can bring a wide range of productivity benefits: increasing individual productivity by allowing people to work while on the move or outside their office or home; augmenting business relations as people remain in contact longer – by reducing the delay in answering customer requests or solving problems for instance; decreasing time-to-market for new services (especially digital information such as news and video); improving process efficiencies by tracking items on the move and extending opportunities to reach new customers and areas. Within Cisco, users of basic mobility solutions value their related productivity gains at over 40 minutes per day on average.

The most sustainable advantage will be achieved by those organisations that also change their business model and processes to embrace mobility. Landspitali University Hospital in Reykjavik has designed their approach to healthcare around new mobility and IT practices. In his essay, Baldur Johnsen, IT Director, explains how their successful implementation of IT and mobility solutions – for electronic patient records, automated medication administration, order communication and remote management of chronic diseases – has helped Landspitali be more effective and share their highly specialised knowledge beyond the organisation's walls.

Mobile devices are rapidly becoming cheaper, simpler-to-use, more powerful and more reliable. For a number of years, the only mobile devices were a pager or a basic mobile phone for voice calls. Recently, however, there has been an explosion in the number and capabilities of mobile communications devices within corporations. Pagers have been overtaken by smartphones, PDAs, e-mail devices, RFID tags and PCs with wireless cards. Similarly, consumer markets have a plethora of options with phones, iPods, cameras, media centres and numerous devices, all wireless enabled. Increasingly, individuals are choosing more than one mobile device to satisfy their requirements. Sales and service representatives will often use a combination of a mobile phone, a PDA-like calendar and/or a mobile-enabled PC.

Executives are adopting a combined smartphone/PDA. Logistics firms often use specialist devices. In effect, a single user can take on several profiles throughout the working day. Each device then serves a specific purpose, driven by the time available, type of application used, and the user's location.

Mobile technology and services are, undoubtedly, coming of age. There is now a wide range of network technologies – phone networks such as CDMA, GSM and EDGE; higher speed networks such as WLAN, EVDO and 3G/UMTS as well as short-range networks such as RFID and Bluetooth. Over the past year alone, mobile broadband coverage has expanded significantly and is now available in a large number of countries. As an example, at the time of writing, there are over 60 3G networks in operation worldwide. There will be a growing range of alternatives in the future, both evolutions of existing technologies and new technologies like WiMAX, unlicensed spectrum, UWB (Ultra Wideband), ultra-broadband and many more. As these technologies offer ever faster connections and more capacity, businesses will adopt mobile technologies across more of their operations, both to make their business more effective and deliver a better customer experience.

The personal nature of mobility shifts the heart of communication from a set of phone numbers (or IP addresses) to a person. Instead of using multiple numbers to reach a person, a single service can be provided that follows the individual. The mobile device in effect becomes an extension of the user's identity. Such personalisation can profoundly affect the way we work, and has led to the blurring of traditional boundaries between work and leisure time. An individual can now respond to calls, messages and information requests from any location, while being selective about when and how to access the information. Context-aware mobile services will allow users to manage their information needs in such a way that they are only alerted at relevant times and places. Fergus Boyd, Senior Manager, Technology Exploitation, of British Airways explains how BA is using mobility technology to enhance their travellers' experience by simplifying the booking and travel process. BA customers can book over the Internet, manage their seat allocation remotely, avoid lengthy queues by checking in at airport ticketing kiosks and receive automated SMS text messages with travel information on changes during their travel. It is a personal service highly valued by BA's customers.

Digital content is becoming more and more pervasive with the digitisation of business information, television, radio, music, film and photography. This content can increasingly be accessed and delivered to users on the move, whether it is new prices on a corporate intranet or video footage of a market-changing event. There is a growing need to manage this digital content and provide it as quickly as possible, to satisfy the user's thirst for information when and wherever he needs it. In his essay, Nikesh Arora, VP of European Operations at Google, illustrates how the information market has become impulsive, instantaneous and portable.

Mobility changes the way we work

Mobility is fundamentally changing the way individuals work. Office workers can now move from office to office using a mobile phone and a wireless-enabled PC – using a single phone number, one email and one IP address as their identity. Mobile workers can make phone calls, respond to emails, update calendars, browse the Internet and access corporate applications from a taxi, a train, an airport or even a coffee shop. A new breed of telecommuters are getting used to life without fixed office space – a development with significant cost savings for their employers and opportunities for better working practices such as flexible work hours and home working. In fact, even recruiting practices can now be more flexible, as employers are less bound by a candidate's geographical location and can focus mainly on skillset.

Intel's Director of Mobile Technology, Ticky Thakkar, describes how wireless working is resulting in smarter working rather than longer working hours. All of Intel's sites have been wireless enabled and internal research shows that Intel employees are now more likely to 'time slice'. They are squeezing more work into previously unused small chunks of time, such as en route from one meeting to another. It's not about working 24/7 but rather about exploiting mobility to increase productivity during working hours and to enjoy a better balance between work and leisure time.

Mobility changes the face of business

Businesses operate in highly competitive and rapidly innovating markets where any source of advantage needs to be delivered sometimes instantaneously to the customer. Mobility helps adapt every aspect of a business to these challenges – affecting customers, workers, goods, vehicles, suppliers and products.

Successful implementation of mobility in business will be a step-by-step approach. Initially, businesses use mobility to improve communications and to connect existing work procedures, targeting key processes or groups most likely to benefit from mobility, such as the field sales and service teams. Secondly, mobility is used to link multiple groups and processes together to improve collaboration, often including executives and mobile workers. Thirdly, businesses reach new customers, channels and suppliers through mobility, where whole supply chains and industries can be linked together. Over the long term, opportunities even exist to design entirely new businesses and approaches using mobility, such as virtual manufacturing and logistics, or new modes of operation, such as office-less business. The essays that follow provide a number of examples of how businesses are being shaped by mobility.

The International news agency Reuters is using mobile solutions to speed up its information flow. Reuters' Editor-in-Chief Geert Linnebank explains how news agencies can report on the most recent news events, as they happen, using a wireless-connected PC, phone and camera. Events can be covered virtually in real time and simultaneously sent to a large number of interested parties. The advent of mobile technology has allowed each reporter to become a full news team, providing live video, sound and text. In Reuters' business, the value of information is measured in seconds, and the ability to report immediately on the latest developments in Iraq, or the unfolding devastation of a tsunami, gives Reuters its competitive edge.

In education, mobility is opening whole new areas, as students, teachers and researchers are no longer tied to specific locations. This creates the oppportunity for individual institutions based in one place to share education services regionally, nationally and even worldwide, explains Dartmouth College's CIO Larry Levine and Director of Technical Services Brad Noblet.

Mobility can also open new distribution channels that have a direct, favourable effect on the bottom line – both financially and in terms of user satisfaction. Gino Menchini, IT and Telecommunications Commissioner for New York City, explains how, in the aftermath of the September 11th, 2001 terrorist attacks, the city was struggling to keep up the information flow, partly due to saturated commercial communication networks. This issue has been resolved today, partly through innovative services such as 'Reverse 911', which keeps citizens informed through a push service which sends emergency alerts and updates to the subscriber's handset or pager.

Mobility can even change the way markets operate. In his essay, the author Howard Rheingold outlines how mobility promotes collective action, creating new ways for society to interact and create value, levelling the competitive playing field for small businesses to compete more effectively. Small farmers in developing countries are among the world's most disadvantaged economic players. Traditionally, they have had no choice but to accept the prices offered to them by sometimes unscrupulous middlemen, as they had no access to timely information about commodities markets. In Kenya for example, market information on crops is being made available to farmers via SMS and kiosks – and is already starting to improve trading transparency.

Across the business world, operational processes are being improved through the adoption of mobility. A number of processes can be completely automated, streamlining operations and focusing resources more effectively. The addition of wireless machine-to-machine (or device-to-device) communication can greatly improve and automate information flows. Andy Mulholland, Group CTO and Mal Postings, Global Lead for Mobility and RFID Solutions, of Capgemini provide several compelling examples of how businesses are moving to a service-driven architecture where knowledge is directly embedded in the business process, giving timely information based on machine-to-machine communication.

The telecom service providers' challenge

Despite the benefits which mobility can bring to organisations, the number of wide-scale mobile deployments are still limited today. Broader adoption is often held back by concerns over costs and the complexity of mobile services. CIOs and CTOs need to be confident that the solutions are easy-to-use, secure, aligned with business processes, and most importantly represent manageable, justifiable costs related to the business benefits. In her essay Agnes Nardi, Managing Director of Hutchison Telecom, explains how service providers must address the issues of increasing network speeds, ensuring full security to protect user profiles and transactions, while simplifying user sign-on and billing. Resolving these concerns will open up mobility services to a broader user base. Today, a pilot approach is being used by most companies to pave the way for broader adoption over time, as early benefits are measured and the associated risks can be controlled.

> 'How the future unfolds will depend on the ability of service providers and businesses to work hand-in-hand to shape mobile solutions and incorporate them into business processes.'

As one of the key mobile service innovators in the United States, Sprint is working hard to help enterprises become more confident about adopting mobile solutions. In his essay, Len Lauer, President and COO at Sprint, describes how his company is developing managed services which will help empower CIOs to confidently incorporate mobility into their operations portfolio.

For the end user, the underlying technology is unimportant as long as they can access mobile voice and data services anywhere and at a reasonable cost. Swisscom Mobile provides an innovative service, 'Mobile Unlimited', which seamlessly connects a PC across GSM, WLAN and DSL networks, whichever is available, and keeps the service connected on the move without the user being involved. It is the first of a series of mobile services (business and personal) that will be provided across a range of devices, using multiple technologies – but where the user is unaware of the underlying connection mechanism.

The aim of mobile connectivity is to appear as serenely effortless as a swan gliding on water, explains France Telecom's Executive Vice President for Enterprise Communication Services Barbara Dalibard, but beneath the surface, there is inevitably a great deal of hard paddling to make different technologies and applications integrate and 'talk' to each other. In her essay, she describes how France Telecom focuses on offering a fully integrated user experience, across multiple types of fixed and mobile access technologies, thanks to the integration of all France Telecom operations.

In an increasingly digital and mobile world, the telecommunications industry is evolving from a vertical value chain, where a single operator provided everything from devices to networks and sales channels, to a much more horizontal model where multiple players are needed in order to provide all the elements of a full mobility service for a business. This emerging industry will need to bring together network operators, handset manufacturers, application developers, content providers, system integrators and resellers.

Vodafone's CEO Arun Sarin and Group Strategy Director Alan Harper describe how this evolution requires telco providers to spend more time working with business customers on their premises, in order to develop solutions tailored to their specific needs. The IT industry has been doing this for some time, and the authors explain how it is now crucial for mobile service providers to build partnerships as they provide increasingly complex solutions to their business customers.

The mobile revolution: the next steps

Considerable change in both business and society will be driven by the further development and broader adoption of mobility. How the future unfolds will depend on the ability of service providers and businesses to work hand-in-hand to shape mobile solutions and incorporate them into business processes. The full convergence of technologies, services and applications will unleash a tremendous opportunity for improved productivity, as companies interlink all aspects of business operations at all times. A simple, seamless experience for the user, where he or she no longer needs to think about how to connect – being managed by the intelligence of the network and service – is the ultimate goal for reaping the full benefits of mobility. Success in business will be driven by the most integrated and innovative uses of mobility by customers, employees, businesses, and suppliers as well as within products.

Societies are opening up as mobile communications cross borders and limit censorship. Individuals have the freedom to operate from home or while travelling and to explore new ways of working. As society becomes increasingly mobile this leads to more decentralised markets, organisations and industries, which are less prone to market downturns.

The essays in this book touch on these opportunities across a range of industries and among the main providers of mobility. They represent only the beginning of a phenomenal journey. We hope that you will enjoy them.

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Other information sources:
Internet statistics: www.global-reach.biz/globstats
Mobile statistics: www.gsmworld.com/
SMS statistics: http://www.mda-mobiledata.org/

Users of mobility

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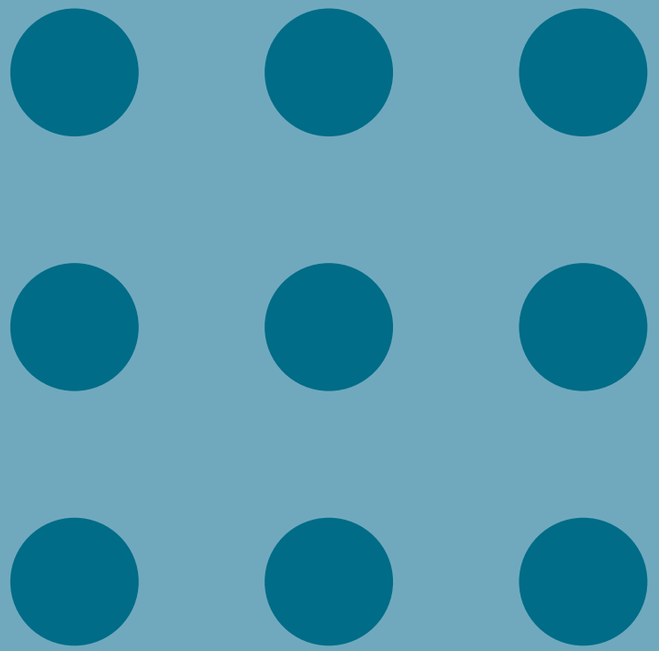


1

Flexible flying

Fergus Boyd | Senior Manager, Technology Exploitation, British Airways

British Airways' business strategy is based around customer service. Fergus Boyd explains how mobility underpins their approach to communications, and their ability to interact with customers in the most appropriate way at every step of a journey. This essay covers mobility solutions – implemented and planned – across most British Airways user groups: the traveller, the crew, ground staff, sales force and cargo handling. The road ahead, including the technical and security challenges faced by BA, is also explained.

British Airways is the UK's largest international scheduled airline, flying to over 550 destinations and carrying more than 36 million passengers (2004–2005). The airline's two main operating bases are London's airports, Heathrow and Gatwick. The British Airways Group fleet counts almost 300 aircraft, and the company employs about 47,000 staff, of whom 15 per cent are based outside the UK. Unlike some of the world's other airlines, British Airways is owned entirely by private investors including some 49 per cent of the company's own employees.

As everyone knows, the airline industry today is an extremely challenging business environment. Airlines are essentially customer service organisations; BA is especially so and prides itself as such. The nature of the service we offer makes our workforce a mobile workforce serving customers on the move. Hence, mobility presents many opportunities to improve our competitiveness. In a world where network airlines like British Airways have to compete with 'no frills' rivals, connectivity not only offers benefits but can also help give us a competitive edge. Mobility is about effectively being connected anywhere, at any time, to do anything.

As an organisation totally focused on customer service, our primary goal is to use mobility within our business to improve our customers' experience, from thinking about booking to going through the airport and boarding the plane, to using it for the businesses whose cargo we transport, and also of course our own staff. So we see the role for connectivity extending across a wide spectrum of uses: from enabling customers to revise booking requirements or confirm flight details en route to the airport pre-departure through to making online access available in BA lounges and – possibly in the future – on board planes; conveniently allowing BA staff to take more control over their daily working lives such as by enabling them to self-manage work shifts as cabin crew do, through to improving the efficiency of BA cargo handling.

> 'Improved productivity on its own is not enough. It is not enough to say wireless is essential because of the urgency of the work it enables. Mobility, like any investment, needs to find a compelling business case with clear benefits and cost savings attached.'

1.1

Principles

Golden rules

A central building block of our strategy has been the development of a cost-effective, easy-to-use, attractive online proposition. The fundamental architecture we have established is all about working towards the presentation of all our services to all our customers and all our employees through all available channels. To ensure this is clearly understood we have developed four Golden Rules:

1. Make the customer proposition simple and compelling
2. Design processes for end customer use
3. Do it right first time
4. Single BA solution

So instead of having a call centre channel run one way and an online channel managed separately, we are working towards a single process for all services across all channels. We see mobility as a key enabler of this strategy – widening the window on the core services of the airline, and an opportunity to deliver to BA customers the services we provide using the same processes whatever channel they use.

Mobility cases must save cost

Where we are investing in mobility we are focusing on projects where impact can be clearly illustrated and return on investment (ROI) is clear. We would not be where we are without making sure we invest in the best possible way, so each IT investment must make its case – several times! Improved productivity on its own is not enough. It is not enough to say wireless is essential because of the urgency of the work it enables. Mobility, like any investment, needs to find a compelling business case with clear benefits and cost savings attached.

There are many examples of how we are working to implement mobility and prove its business benefit, both through our internal interaction with BA employees and our external interactions with customers and businesses.

Customer mobility

Information for customers over the phone

On the customer-facing side of our business we are developing mobile services across all available channels. This starts at the very first step of the travel process where some customer-facing projects are mobile-phone-based. We recently relaunched an upgraded mobile service – having found its predecessor, launched two years ago, too slow and the technology over-hyped. Our second-generation mobile proposition is a BA portal on Vodafone Live. It contains information relevant to a customer's journey, such as flight alerts and Air Miles checks. We hope to expand this onto other mobile networks in due course.

'Up to 24 hours before you fly, communication will be via email, but after that it will be via SMS – to update travellers on weather conditions, for example. Understanding the appropriate way to interact with customers at every step of the journey is very important.'

Last year we switched some of our flights between our terminals and we can now tell our customers what is going on automatically by pushing information via SMS text meesages to their mobile phones. If there is a mobile phone number on a booking we push the information automatically. We are not marketing to the customer – this is simply duty of care. Clearly, though, once you have a new communications channel to the customer, other opportunities arise. So now we also operate a standard push and pull service: if a customer wants specific information about their flight they can request it and receive it via SMS. So far we're nine months into the trial and if feedback is positive we will continue.

Terminal queues

We are starting a trial within the airport environment where staff walk around with a ruggedised device used to do things such as queue-combing and ad hoc check-in for transit customers who might be lost. With queue-combing, if you see a long zig-zag queue of people our customer service staff walk to a person and check what kind of ticket they have or, if they're able to use the self-service ticketing machines, you direct them to do so, taking them out of the queue. A future possibility is doing precheck-in seat allocation and all of the other tasks that don't require a piece of paper to be printed, too. We've not quite gone that far, yet. Mobility means on the move. By enabling ba.com to 'make all your transactions so easy you want to do them yourself' before arriving at the airport, the hassle of travelling through the airport is reduced. We now provide on our website, ba.com, the ability for our customers to serve themselves before they arrive at the airport, such as flight times, seating preference, meals, and so on – online. We are putting the customer in charge. But this isn't just about selling the service and easing the check-in process; it also underpins our approach to communications. So up to 24 hours before you fly, communication will be via email but after that it will be via SMS – to update travellers on weather conditions, for example. Understanding the appropriate way to interact with customers at every step of the journey is very important.

Arrive 'ready to fly' enabled by mobility

We currently have 250 or so kiosks in airports. These are very functional devices – in effect, a PC in a box. They are well used but the next step is to enable the same capability on a mobile device that you can carry with you as you walk around. We're trying to get as much of the interactions out of the airport as possible so that when you arrive you are ready to travel – you're pre-checked in; you've got your seat; you've got your boarding pass and you can go straight to the gate. We've had PC check-in available for customers for three years. The next step is to enable more customers to do this before they leave their office or home. This raises the possibility of mobile check-in at some point in the future. We are looking at a pilot scheme for passengers to use SMS to accept or refuse a specific seat allocation.

Arguably, one of the most visible applications of mobility is the switch from cardboard-based ticketing to electronic ticketing. We are watching what other airlines are doing with interest. Qantas, for example, is piloting barcode ticketing using mobile phones. Finnair and SAS are doing SMS-based check-in. In the US, meanwhile, they've already switched to bar-coded tickets and boarding passes.

Many people remain attached to cardboard tickets, but substituting an email that tells you you've got an e-ticket with clear references is a great step forward. The next step is to enable people to process all their requirements, and this needs to extend to baggage as well, so, for example, you can book excess baggage in advance.

BA lounge services

Once 'ready to fly' and at the airport, customers should be able to spend their time the way they want to, and this includes their time in our lounges. In July 2004 we began rolling out wireless LAN provision in many of our access and VIP airport lounges through BT Openzone. This was developed in response to demand from customers who found themselves with 25 minutes to an hour to spare in one of our lounges. Staff can use the same service when they are travelling on duty.

Onboard retail and connectivity

Another onboard aspect of mobility that's been more straightforward is related to onboard retailing. We're now using standardised mobile devices in the onboard retail environment to replace kit we've used for 15 years with what is, in effect, a standardised PDA – a small PDA device with a printer. The business case here was pushed by the need to take onboard chip and pin technology, which will become standard for all UK transactions from 2005.

The key change here is that when a customer wants to make a purchase, the device is handed to them to tap in their pin code and then return it to the cabin staff. For customers this provides secure transactions onboard. For the airline, the new machine is only a quarter of the weight of the old one and one tenth of the price, but still using standard components. We're using a similar device to the one in the retail trolley on board in the galley for things like the customer manifest and defect reporting – it will even include safety and equipment procedure manuals. It's all about reducing the need for some of the manuals required on board. Staff training has been required, which has been targeted at the cabin service directors who look after the entire cabin crew on board.

We're now also considering connectivity for customer devices on board. Within a few years, cellular phones may be approved for use on aircraft because certain equipment can be added to force the power down.

Employee mobility

Cabin crew mobility

Connectivity levels within BA are extremely high for an industrial company. In the UK, for example, around 96 per cent of BA staff use our intranet, branded Employee Self Service – the other side of the coin to our customer self-service. Cabin crew rostering is a good example of a service we encourage our staff to manage themselves, online via our employee self-service portal where they make their bids for forthcoming work. They can do this at the crew centre, down route in the crew hotel, or anywhere they can obtain web access, at home or overseas. We have found this to be valued highly by staff as it puts them in control and there are many cost advantages over the previous system we used, which was heavily reliant on telephone call handling. Putting it simply, this system is a convenience for staff, many of whom are part-time, and a cost saving for the airline.

Road warriors

For BA employees who are 'road warriors', mobility has to displace existing incumbent technology and ways of doing things. Currently the majority of BA employees who have laptops have to plug in and dial a certain number and they'll get the normal 30 Kbps, etc. There are probably 100 or so people who've got broadband at home for work reasons. Those with broadband tend to be sales people who will come back to work intensively at home for a couple of days before going back out onto the road again. So they've got higher connectivity. The mobile devices we use need to be more functional and more expensive than your average cheap voice phone. Choosing the right devices that are 'rugged' enough for such use yet cost-effective is something we are continuously examining.

> 'What we're trying to do now is deploy some of the most frequently used intranet sites like 'BA news headlines' eg latest business information and 'Operational information' eg status of flights in the terminals, onto smaller devices – be they wireless or cellular, and let our staff have access to these on the move.'

Mobile sales force

We are also running a number of employee-focused trials using WiFi and new cellular network technologies – GPRS/3G. They're targeted at BA staff who need to move around between different BA buildings, or sales representatives that go from city to city or around Europe – anyone, really, who roams frequently but still needs to connect to a background BA system. Again, the business case for this is challenging because of the alternatives available when they are on the move. So the key issue for us is what can the system actually improve? Our focus here is on the 'closure concept'. It's the difference between being able to tell a client 'we can close the deal right here and now' and saying, 'You write up your notes, we'll write up ours then let's meet up again in a week or so.'

Intranet on mobile devices

This isn't about giving everyone a laptop. Of course we can save costs in this way if an exec only ever uses their laptop to receive and send email. But our approach is to go for a more open infrastructure, again, saving costs wherever we can. At the moment we have a very functional, very rich intranet portal through which we can do pretty much anything from looking at contact details, to staff travel, to adding requisitions to our purchasing systems. But it's very much designed around a 15-inch screen. What we're trying to do now is deploy some of the most frequently used intranet sites like 'BA news headlines' eg latest business information and 'operational information' eg status of flights in the terminals, onto smaller devices – be they wireless or cellular, and let our staff have access to these on the move. So it's about repurposing intranet material to extend the intranet into other areas.

Mobility in BA World Cargo

Cargo alerts is another one of BA's mobile projects. Equipping people with the best tools to do their work is extremely important in this environment. In one of our large cargo terminals at Heathrow where all the BA cargo gets shipped in and out and where trucks offload, the 'dolly' drivers ('dolly' is a term for specialised carts that carry baggage and freight to or from the aircraft) who move freight to where it needs to be. They take the pallets and Universal Loading Devices, (specialised containers for planes) to the planes then come back for more. To do this, centralised task allocation is required, and drivers would repeatedly return to base to get new orders before going back out again. We've now replaced this with a GPRS-oriented task allocation system. So each driver goes out in the morning and does not have to come back to base to get information about the next job – the device that sits in their cab pushes information to them. Drivers can be automatically assigned jobs depending on where they are and the weather conditions.

'Fundamental challenges remain, of course, such as those around security and resilience – key issues for the airline business post-9/11. Once you start being more mobile then you could open yourself up to more ways in, or more ways for potential problems to arise if you do not take the right measures.'

The business case around this was very much about displacing the existing infrastructure that we used to provide that service. The old system was expensive. We've now switched to an open public GPRS network which is considerably less expensive. And we're now examining the next level. For instance, if the airport has disruptions, then everyone's on their phones and if the cells get busy, we get busy as well. So far that hasn't had an adverse impact, but there's a risk. Telcos must move towards providing operational quality of service. Partitioning networks, however, will rectify this as it will allow operational traffic to take priority over other calls.

Information for staff over the phone

Having established a new communications channel to the customer using SMS to push information to their mobile phones, other opportunities arise. We ran a small project recently using SMS to manage staff working as volunteers around the airport during our busy operational periods such as Bank Holiday weekends. We were able to direct staff around the airport via SMS, telling them where they are needed and what they are needed to do.

Wireless at HQ

One of our more high-profile internal, employee-focused mobility initiatives has been our introduction of wireless into office buildings. An example is at BA's HQ, which houses around 4,000 BA employees, where an inner atrium known as The Street comprises several different hot spots. These hot spots fall into one of two types. Some are 'public visible' – a BT-managed service for public access by anyone passing through the building. Others are 'staff visible' – our own secure network solely for the use of BA staff. There's some wireless in a neighbouring building too, the Compass Centre, where there are more office-based staff along with BA's operational crew and pilots. BA's approach is to selectively target and prioritise the business groups who would find the greatest value in roaming technology and who would make the most of 'dead time' between meetings for those attending the HQ offices.

1.1

What the future may hold

Common User Self-Service

Looking ahead to the future, a number of mobile developments will be of particular interest to the airline business. One is Common User Self-Service Kiosks – a generic box which would be used by all airlines. So in effect, all airlines would share the cost of equipment and spread the investment rather than each developing their own kiosks. Airports would find this a better use of their space, too, although an issue here remains where kiosks can be best positioned.

Mobile location services

Currently, mobile location services are embryonic although they do exist on portals such as Vodafone Live. Around airports there are dozens and dozens of cells but the actual size of cell bubbles is quite small. The clever bit will be whenever the telcos can introduce 'geo-fencing', whereby once a person walks into a particular cell something happens – an alert to say: 'You've just entered Terminal 1 but you should be in Terminal 4,' for example – which is far more useful than constant polling.

For the time being, however, the incumbent way of doing things remains the only practical option. A case in point is Gatelink, an old idea that will probably come back but not yet because of its cost. Gatelink is a way for ground staff and aircraft to communicate wirelessly when a plane is docked on the ground at a pier. At the moment, people still need to board the plane to plug in wires or change a CD or floppy, for example. In the future it will be possible for all sorts of things to be done and checked automatically – for example, to measure how much fuel has been put in, whether catering has been provided, and so on. But the infrastructure required both on board and at-the-pier costs. What will make it work is WiMAX and extended wireless LAN technologies, where there's no need for individual pier linkages because you have a huge central hub a few kilometres away, which creates one big bubble.

Challenges ahead

Fundamental challenges remain, of course, such as those around security and resilience – key issues for the airline business post-9/11. Once you start being more mobile then you could open yourself up to more ways in, or more ways for potential problems to arise if you do not take the right measures. There's also the issue of identity management. Knowing just who you are interacting with and being able to find groups of users easily will become increasingly important.

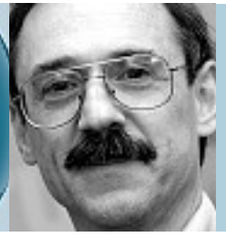
Another challenge for the industry relates to suppliers. In our view, the best strategy for us is not to become aligned with or dependent on any single supplier or technology. Telecommunications technologies, both in terms of voice and data, are continuously evolving and developing, as are the providers of such technologies. We are interested in the opportunities that all these technologies make available, that they are open and that we can use them. We all know voice and data are coming together and that being able to provide these globally will be key, but no-one is yet doing voice and data globally to the same standard. We watch this area with particularly close interest. Then there's the matter of how best to manage staff connectivity. As convergence accelerates, we must acknowledge that staff will be using the mobility infrastructure we provide not just for work but also their non-work activities, so we must understand and accommodate the implications of that.

Mobility can significantly help our staff be more productive and improve our service to the customer. Put all of this together and the business benefit is clear: mobility can help us all become a more efficient general aviation business.

For more information on British Airways see www.ba.com

Education on the move

Larry Levine | CIO and Associate Provost for Information Technology, Dartmouth College
Brad Noblet | Director of Computing Technical Services, Dartmouth College



Wireless is fast becoming a central tool in the academic process, enabling institutions to provide real-time, pervasive information access and exchange. The net effect of investments in wireless technology is the ability for academic pursuits to take place virtually anywhere, effectively decoupling the learning process from the location. Dartmouth College is at the forefront of technology adoption on campus, allowing professors, students and staff to freely communicate and learn in a boundless and stimulating setting.

Dartmouth College is the ninth oldest college in North America and a member of the prestigious Ivy League of US colleges and universities. Located in Hanover, New Hampshire, Dartmouth has a long history of innovation and leadership in research and teaching. Despite being situated in a rural area with limited broadband connectivity, Dartmouth has implemented a vision for a campus-wide converged network capable of carrying voice, video and data wirelessly.

Overall we really have changed the way people learn, work and live here. Initially we saw wireless as an added feature or overlay, but now people count on it as much as on the wired network. Usage increases all the time. Wireless is fast becoming a significant and central tool in the academic process and its importance will only grow in the future.

Our experience so far demonstrates that wireless is the best way to provide access to all students in a cost-effective way. Wireless applications we have implemented so far have enabled the development of location-aware services, such as the ability to enter a laboratory and, based on your location, immediately find out information about resources, for instance to use a particular piece of equipment. Our language lab facilities, meanwhile, can now be used from anywhere on campus. Collaborative activities have been another focus for development with wireless used for the exchange of class notes, group voice calls and so on. And then there are the more personal uses for wireless, such as the role it now plays in the more efficient management of campus laundry services by students, and a recently introduced service enabling students to use their laptops to set their phones to ring as an alarm clock.

Our firm belief is that wireless will be a major influence on Dartmouth College's IT role and philosophy in the future: allowing us to become a first-class enabler of information access and exchange in support of being a foremost higher education institution.

The net effect of our investment in wireless technology is that academic pursuits can now take place virtually anywhere – in classrooms and other academic buildings, in residence halls and even outside. It's about providing ubiquitous smart classroom capabilities anytime, anywhere. It's all part of our philosophy that a classroom can be anywhere and learning takes place all the time. With wireless added into the educational equation, teaching can be supplemented by Internet access and collaborative working no matter where a class convenes.

1.2

> 'Our experience so far demonstrates that wireless is the best way to provide access to all students in a cost-effective way.'

A belief in providing people with access to each other and to information anytime, anywhere, as voice, video, or data, – even if someone is travelling halfway round the world – is an underlying principle of our mobility vision. It's no longer the case that if I'm in the workplace I'm at work, and if I'm at home I'm not at work. Boundaries have blurred. I can work anywhere, I can be in touch with my family, colleagues, friends anywhere. I can collaborate with people anywhere. I can multi-task, fulfilling multiple roles or selves at the same time. That's a huge thing for the nature of how higher education works. Faculty in particular are professionals in their fields as much as or more than they are members of their institutions. Their colleagues and collaborators are in multiple places, from across the hall to across the globe.

Looking to the future, convergence will be a major theme. Access will primarily be wireless because people will depend on an appliance, whether it's a PDA or a smaller laptop. It's going to become the centre of their universe. Voice, data and video will be converged into a same device and, just like somebody who lives in a metropolitan area today never needs to find a public phone, it doesn't matter where you are: your phone just works if you take it out of your pocket. It'll be like that for what we think of as computing.

The whole concept of traditional telephony is archaic. In five years we hope telephony will be on the way out and that you have a specific identity rather than different physical locations having different phone numbers. And these identities will be available online – the virtual, immediate presence of people interacting with each other as they are and not as some device with a numeric address access number. People will be able to retrieve more accurately and quickly the information they want to get, and they'll be able to interact with that information in much freer ways in terms of things that are referenced and linked, and capture and manipulate it easily then share it in different forms with people on the fly, in real time or asynchronously as needed.

'The net effect of our investment in wireless technology is that academic pursuits can now take place virtually anywhere – in classrooms and other academic buildings, in residence halls and even outside. It's all part of our philosophy that a classroom can be anywhere and learning takes place all the time. With wireless added into the educational equation, teaching can be supplemented by Internet access and collaborative working no matter where a class convenes.'

Tomorrow we're going to be in the content delivery business, so how we manage content – particularly how we direct people to that content – will be a bigger part of our job. Today is all about access and capacity, so you have an endless system of services. Knowing your identity means you can control what you require as a user of the system, so availability of things like telephony and other services is going to become more automated and more widely rolled out on this campus. So if you go to another campus, for example, you can use your identity to authenticate yourself and access resources because you're a trusted member of the global community. We'll be more in the business of providing content and direction to content.

Dartmouth's entire 200-acre main campus has been wired since 1985, providing access for students, faculty and staff to the campus LAN, which links all residence hall rooms, academic buildings, administrative offices and mainframe computers on and off campus. Nearly all of Dartmouth's 4,000 or so undergraduates and most of its 1,500 graduate students live on campus, and therefore in a networked building. Then, four years ago, Dartmouth upgraded its network with a campus-wide wireless overlay – a new wireless computing network ensuring access to the campus network and the Internet from virtually anywhere on campus. This wireless local area network (WLAN) is currently used by approximately 2,200 simultaneous users, and growing.

All of our students on campus have WiFi-enabled laptops so all resources on campus can be accessed through the WiFi network. When they go outside the campus, however, how they access the network is much more out of our control. In this highly rural and sparsely populated area we still provide dial-up lines, so if from home or even if while travelling the worst came to the worst you could make a phone call back to a Dartmouth modem, but nowadays increasingly even here 'in the sticks', when people go home they have connectivity. As more of our population are now finally able to get cable modems or DSL, we can also make people's houses wireless and put a router in front of their wireless access point with a VPN in it so they're on the Dartmouth network at home. Being on the Dartmouth network means not just computing, but a Dartmouth telephone number and Dartmouth's offering of video channels. A laptop, then, has become a prerequisite. Whether or not a student has a cell phone, however, is up to them. And one of the reasons we push networking so heavily is that the area is very rural and cell phone coverage is really poor.

1.2

Our telephone service has undergone a major upgrade. We have moved all faculty and staff to pure Voice over IP (from the instrument to the connection to the Public Switched Telephone Network). In 2006, we'll migrate students over to VoIP as well. Now we're not replacing students' telephones with VoIP phones, because we can't expect students to spend $150 or $200 on a new phone. Instead, we're offering students phone software ('IP Communicator') so anything capable of transceiving sound and working on an IP network can be 'a phone'. We sell them a very inexpensive USB headset and microphone and give them a phone number with it. And we lease them a Vocera device if they're interested.

We are just beginning to execute migrating the campus-wide video network – an ageing cable TV infrastructure – into the wired and wireless IP network to enable streaming video. Wireless video by the way is one reason why we're evolving our wireless overlay to include 802.11b, a, and g. We'll use 802.11a for video. Convergence is a fundamental part of our mobility vision. During 2006 we'll achieve a strategic goal – manage a single IP network and do voice, video and data together to provide truly integrated services and technologies for users both on campus and further afield over a single network.

For true convergence to occur, ie for technical environments to converge our communication behaviours, culture, devices and networks must evolve further. A lot of us have believed for some time that PDAs are too small or low featured: they lack the right type of screen and the right types of input. The laptop has been great because it allows for more interactive and real-time services, but it's very inconvenient because you've got to stop and open it up. Maybe in the not-too-distant future we'll be able to see some sort of ubiquitous model device – like the Treo, scaled up a little, perhaps – that will look and act like a laptop but incorporate the kinds of capacity, processor and peripheral technology that allows all of these converged services to exist

in one device. We're also very interested in when cell phones will become dual mode. A combination of GSM cell phone and wireless – a WiFi or WiMAX-style solution – will enable users to go back and forth between the two.

There are many specific examples of how we are putting our mobility vision into action. And our starting point has been to explore just how wireless technologies can most effectively be used.

We've been conducting pilots at Dartmouth's Thayer School of Engineering, for example, where we couple wireless and location-dependent services so that you can walk into a laboratory and, based on your location, get information about resources in that laboratory – such as how to use equipment. We also use the technology to contextualise the information resources – pushing specific class notes and collecting specific class assignments associated with a particular class in a particular room at a particular time, for example. We're not yet doing this with every course, but it's evolving. Another example of how we're going to expand this thinking is the library, where we will uplink location-dependence with information. Some students at Thayer are actually writing software to augment the Vocera service, which would allow you to be on a particular floor and ask, for example: 'Where am I?' to receive your location.

Vocera is both powerful and flexible. There's another pilot going on to use Vocera in the wireless network to create a virtual group so they have instant contact with group members at any time. They've been using it within a team to assemble ad hoc meetings or send messages to group members when someone comes up with an idea or has a problem. This saves all the scheduling hassles of trying to get everyone together in person or on a conference call; you can also voicemail to the grouping rather than having to open up a laptop to send somebody an email. We now also provide streaming video from Dartmouth campus to anywhere in the world for use by other academic institutions. So, we can add audio and video to the mix anywhere – you don't have to be in any particular area to use it.

Despite the limitation in cellular coverage in our area we have made the entire campus environment seamlessly mobile. Take the college's language lab – a classic student application where, particularly in the spring, summer and fall, students are now able to be out on the green, practising their language skills. These are basic applications but offered in a highly mobile environment. Because they don't have to plug in and schedule time at a particular workstation inside, you reduce the risk of individuals' schedules clashing with each other. Instead you increase opportunities for collaborative practice and learning. This also provides the faculty with the opportunity to make flexible decisions about where they want to teach a particular class, or about what the 'what' and 'when' of classwork will include. The end result is that no-one is locked into one particular location or system any more.

Aside from the ability to work anytime, anywhere and collaborate more effectively, wireless offers other potential academic applications. These include 'smart classrooms', where professors can interactively broadcast course materials direct to each student's laptop during class; greater support for researchers enabling them to collect and analyse data from remote locations and receive instant feedback; the ability to allow students to monitor class or laboratory projects from anywhere on campus, checking computer system status, observing biological or chemical equipment or monitoring other instruments; and shared calendars instantly informing students of changes in class meetings or schedules. In addition, students and faculty may soon find new ways of collaborating on projects using a shared virtual 'whiteboard'. Voting in class using handheld devices is another possibility. This too is part of Dartmouth's philosophy, advancing a rich environment as a base for people to together discover their own unique uses.

> 'During 2006 we'll achieve a strategic goal – manage a single IP network and do voice, video and data together to provide truly integrated services and technologies for users both on campus and further a field over a single network.'

1.2

At a more personal level, students' day-to-day lives are also benefiting from mobility. Take the student laundry service. The new equipment we're buying is networked, allowing you to log into a web page and see if resources are available and schedule which laundry facilities you want to use where and when. Meanwhile, a group of students asked us to create a website that ties into the telephone system to get on the Web and programme their phones to ring at any time, like an alarm clock.

A new initiative in this area is the Dartmouth's Digital Dorm project about identity and connectedness. It's going to allow us to explore how technology plays a role in identity and, specifically, the impact on identity of offering a variety of services. Imagine a 'smart house' concept where you walk into the living room and, based on your identity, certain services become available – such as news, or music. Ours is a highly mobile network. We're involved with various vendors and groups and we're going to build a number of new residence halls and turn them into mini-communities. We've been talking with Cisco, Intel and Microsoft to gauge what's possible, what they are most interested in, and how we might collaborate.

A number of underlying principles are directing our approach to mobility. The first is our belief that we are serving a community – a community of people who study and teach and work both on campus and away from campus. Dartmouth tries hard to make everyone feel they are an engaged member of

a vibrant community. A lot of the alumni are very active with one another and Dartmouth.

A second principle, information anytime and anywhere, relates to the specific needs of our wireless users. Within the Dartmouth community, people are mobile in two ways. First, by physically moving around campus. Second, by actively engaging in work requiring continual interaction and collaboration with colleagues and information resources, similar institutions and also organisations in other sectors – commercial, government, and so on. They use data, voice and, increasingly, video. So part of our job is to support their needs for accessing information and sharing it with each other.

'Within the Dartmouth community, people are mobile in two ways. First, by physically moving around campus. Second, by actively engaging in work requiring continual interaction and collaboration with colleagues and information resources, similar institutions and also organisations in other sectors.'

There are, however, a number of challenges we are having to meet as we work to realise our mobility vision. The first is financial. We must remain focused on just what does technology add to an environment that already brings together small groups of students and faculty in an intimate community milieu? We cannot let ourselves get carried away with hypothetical benefits. In our environment technology is an adjunct tool to learning and scholarship. You can put information online and manipulate it in ways you never could in a book or by talking to people, and that can greatly enhance any kind of learning setting. But we're a long way away from replacing the human element: insight, creativity, critical thinking are sparked by contact with one another. The broader spectrum of information which you have at your fingertips means that your ability to create or even understand concepts is greatly enhanced, but we are social animals, and IT enhances what happens in relationships, it does not substitute it.

In this way the cost of technology must always result in a value-add, and not be seen as a necessary and misunderstood evil. Even better, we've shown that advances in IT can not only add value but also avoid costs. We look at where wireless was a couple of years ago versus today, and costs have dropped dramatically. It's becoming more of a priority for people, too. One of the things we've been able to do is leverage concepts such as convergence to initiate cost savings that allow us to take money and invest it in new technologies.

On a larger scale, we'd like to build a converged environment that seamlessly becomes part of other converged environments, and part of a larger world-wide public networked environment. We'd like to do that in a way that commercial providers find ways to integrate such environments and enhance them. And we'd like to find ways for our people to use those environments without being billed and metered. For example, we'd like to offer, on campus, a nationwide telephony, cellular telephony, mobile data service that parents can participate in through an association with a large cellular provider. We'd put up cell sites on campus and offer favourable packages that would allow people to get service not just on campus but also when they're home. One of the things about higher education is that you have a broad population – visitors, faculty staff, students, community, parents, alumni. But you don't want to say: 'Give me a dime for that cup of coffee and a quarter to get on my network'.

There have also been technological challenges. For some reason we have found it hard to make wireless work in our biology building – too much metal in the ceiling, perhaps. We finally got some wireless gear that was new generation and we thought this would improve matters so the network group started swapping out the network in the middle of the day, which caused the wireless network to go offline for ten minutes in each area. We got a call from a faculty member, saying: 'What the hell are you doing when I'm teaching a class?' It upset him because it was an unplanned outage of the wireless network – nobody told him about it. However, the call is also a 'positive' if it points to the wireless networking being indispensable.

This highlights another issue: the need to manage people's expectations of wireless technology. At Dartmouth there are some faculty who are hesitant about technology in some settings. They don't want laptops open in their classroom. Other faculty, however, welcome it: they like the fact that students will do a search during their lecture and come up with a question because they were able to get some additional information about a particular topic. So there's a lot of social engineering that must accompany advances in technology for that technology to be accepted and successfully implemented.

Capacity has been a challenge, too. We're making great strides in increasing wireless bandwidth and compressing information such as MP4. But the things we struggle with are how to increase capacity to keep up with demand as new multimedia applications come along. The other thing that's started to be more of a problem is how we manage security and your identity so that we can give you the same seamless open experience of just opening your laptop and computing, yet ensuring that it's secure for you and protects others around you if something you're doing turns out to be a problem. Hiding security from the masses is a huge issue. We can no longer say, 'Come to our enterprise environment and we'll protect you.' Users of technology must become responsibly and actively engaged in security.

We are now actively assessing how all this impacts on the way people work and study – and the implications of wireless technology both within the academic environment and beyond.

One of our faculty, Professor Kotz, quantifies the traffic on the Dartmouth wireless network so we have the information available on a daily basis about the number of people who connect to wireless – around 2,500 over the course of a day at current levels[1]. We know who connects and then, by looking at the transmissions, servers, packets and so on, we can determine what they are doing with it – browsing, email, instant messaging or file sharing. From this you can infer certain things about usage which helps us understand where people are using wireless – in the college student centre, for instance. But we can't tell whether it makes people more productive. We haven't done anything to quantify this experimentally.

1. More detail on Professor Kotz's work can be found at http://www.cs.dartmouth.edu/~campus/

> 'Making a real commitment to convergence on campus, by putting separate structures on a single IP network, has saved us money for staff and in capital outlays, and made things more convenient by enabling technologies that weren't able to work together before, when they were separated, to be accessed centrally for the first time.'

We do have some metrics around how wireless – particularly convergence – has saved us money in the form of infrastructure, however. Over the years we've had separate structures for data, cable television and telephony as well as other private type networks such as security. Making a real commitment to convergence on campus, by putting separate structures on a single IP network, has saved us money for staff and in capital outlays, and made things more convenient by enabling technologies that weren't able to work together before, when they were separated, to be accessed centrally for the first time.

Our experience so far demonstrates that wireless is the best way to provide access to all students in a cost-effective way. And our firm belief is that it will be a major influence on Dartmouth College's role and philosophy in the future.

For more information on Dartmouth College see www.dartmouth.edu

Shaping the information age

Nikesh Arora | Vice President of European Operations, Google

Not only is the need for information growing, but it is becoming increasingly sophisticated. People have moved from wanting basic answers to ever more complex enquiries. Our search for knowledge is insatiable, and Google is seizing that opportunity to organise the world's information. Meanwhile, the information world and the application world are beginning to move in step. Nikesh Arora explores the importance of being able to exercise choice in how, where and when we access information.

Google Inc. was founded by two Stanford University PhD students in September 1998. The company is behind the award-winning Google search engine, which is designed to provide a simple, fast way to search the Internet for information. Offering users access to an index comprising more than eight billion URLs, Google is widely recognised as the largest search engine on the World Wide Web and is the third most-visited website worldwide. Google maintains its leadership position by continually innovating its search capabilities, and has also recently launched new, related products such as GMail, Google Mini, Google Video and Google Maps. Following an initial public offering in August 2004, the company saw record earnings in Q4 2004 of over $1 billion, up 101 per cent from the previous year.

Knowledge has always been a precious and sought-after commodity, most of the time only restricted to an elite. Our mission at Google is to remove that restriction, to make that commodity available to the greatest number of people possible, in the greatest number of places. Our innovative search techniques connect millions of people all around the world with information every day. In few years, we have become the number one search engine in virtually all major countries, with a total of over 327 million unique visitors per month. Indeed, globally we are the third most-visited Internet site, and proof that the world's search for information is insatiable.

The early days of the Internet were defined by the challenge of connecting people to information. Back in 1998, when Google was founded by Stanford PhD students Larry Page and Sergey Brin, the Internet was still a strange and frightening place to people who had never experienced it – a forest full of Trees of Knowledge, of which only some could be trusted.

Somebody had to shape the digital experience, the way people reached out for knowledge. Google was able to be one of the pioneers in the field, and set standards that others have followed. Up until recently, 600 million people were chasing billions of web pages; Google has become the place where they come together.

Unlike the early search engines, which focused on simple 'word matching', Google began from the standpoint of the user – and developed technology that would help them find relevant information on the Internet. We recognised as well that there would be no uptake of a service if the customer found it too difficult, time-consuming or downright confusing to get at what they want. In essence, we created a gateway to the forest, for people all over the world, where they can play and feel safe and trust what they find. Today, Google offers relevant results in under a second, giving people relevant information that will make their lives better over 100 interface languages, in 114 international domains.

1.3

> 'We are the generation in transition to mobility, who can remember how it used to be. We still have to ask questions and explore definitions of what "being mobile" actually means.'

But this in a sense is only the beginning. Even if Google scales over eight billion web pages, we've only scratched the surface in terms of organising all of the world's information and making it universally accessible and useful. Not only is the need for information growing, but it is becoming increasingly sophisticated. People have moved from wanting basic answers to ever more complex enquiries.

For example, we have started to take the world's libraries and put them online. Researchers will no longer have to move across the globe to seek the answers they need; the search for knowledge will take place in your living room, at the bus stop, in the café. Whether it is the entire contents of the National Portrait Gallery or the Louvre, or blogging from Baghdad or Buenos Aires, as we discover more and more ways of digitising content you will find Google there. We see our job as helping people reach new sources of information online, as well as organising and making more accessible the current information that is already available on the Internet.

Having said that, we have to recognise that we are in the middle of a sea change, an ongoing process that doesn't ever stay still. Because we sit in the midst of it we don't see it for what it is. But step away and look at what else is going on around you. What was deemed the norm even five years ago is now no longer the norm.

Once technology has stepped forward, we have to step forward with it. It becomes impossible to step back. We can only ask the nostalgic question: 'However did we manage without this?' One of the current key changes is the expectation for consumers and businesses worldwide to enjoy access to information and communications anytime and anywhere. This is the wireless revolution.

Because she has only ever seen cordless and mobile phones, my seven-year-old daughter has no idea what wires are for. Her perception of communication is entirely wireless. When she surfs the Disney website, she doesn't see a wire making the connection; hers is the truly mobile generation. I cannot imagine that she would ever want to go back to what her parents had.

We are the generation in transition to mobility, who can remember how it used to be. We still have to ask questions and explore definitions of what 'being mobile' actually means. It can mean something as simple as using a device that is unconnected, wire-free. Or it can also mean a far bigger, philosophical concept: a state of mind rather than a physical unfettering. In effect, mobility today is the understanding that it is now possible to access information and communicate anywhere, anytime, exactly as you would if you were at your desk in the office or on the phone at home. For myself, I think of mobility as purely 'the last mile', but it also means being able to have here and now at my fingertips exactly the same connected experience I might have six thousand miles away.

Is this a blessing or a curse? We are probably the last generation who will ask this question. For our children it will simply be the way it is. The generation before us would go to work in the morning and come home again at night, leaving work when they left the office. Work was something that took place at a physical location. Coming home was both a different place and a different state of mind. Sometimes they would leave work at 5pm on Friday afternoon, returning on Monday morning to be surprised by something that had happened over the weekend. Now there need be no weekend surprises. Not only will people be able to reach you to tell you what problem might have occurred, you will have your laptop at home and you will be able to sort it out yourself. Today, we can carry on working wherever we are, so long as we have the means to connect.

This has implications for the pace at which things happen. What used to take a week now takes hours. It used to be that when someone asked 'Can you send me a proposal?' the reply would be 'Yes, I'll put it in the mail'. Now you can email it and save three days. Back comes the response the following morning. With mobile connectivity, you do not even have to wait until someone goes into the office to pick up his or her email. Your partners will connect from home; you could receive your answer that same night.

I see that, on the whole, as a blessing. If you talk to my family, however, they will tell you it is a curse. I am trying to persuade them it is a benefit because my heart rate stays the same throughout the weekend, as opposed to peaking when I hit the office on Monday morning! Clearly it is a question of balance, and as we become more used to the ability to connect anytime, anyplace, we will evolve a set of behaviours and protocols that will protect us from becoming 24-hour a day workers. Because we are able to communicate more easily, we are all more communicative. But that does not mean we have to become crazed by communication. It simply puts more of an onus on all of us to discipline ourselves and use the power of communication wisely.

> 'Within our lifetime we will see distributive businesses in a virtual, global space. Location, bricks and mortar, will cease to matter. Instead your workforce will be sitting in their own homes, logging on to the system in the morning, tracking how many customers are being served online and logging out at the end of the shift in the evening.'

1.3

What are the implications for businesses? We know from the phenomenal success of online businesses like Amazon that purchasing no longer has to happen in a physical place. What has worked so well for books can work for other commodities. Finding out which product to buy does not necessarily mean a journey to a shop and a conversation with a sales assistant in the right department. Instead you can just log on from wherever you are and browse an online catalogue. You are able to look at what you want to buy, rotate your view of it from all angles, pull down a list of its key features, and compare them with a similar set of information for a rival product. All this can take place from your armchair, from your coffee shop, or as you walk along the street.

Mobility will change the number of businesses that exist and the kind of businesses we operate. Already, 93 per cent of the people who visit Google have also visited an online shop in the last six months, and over 80 per cent have made a purchase there. Once a company is able to get the logistics sorted, there will be a shift at some point in time where everything becomes available online. Then there will be no need to replace the 500 people working in a building called a 'shop' with 500 people in a call centre taking

orders and answering product queries for the online store. Within our lifetime we will see distributive businesses in a virtual, global space. Location, bricks and mortar, will cease to matter. Instead your workforce will be sitting in their own homes, logging on to the system in the morning, tracking how many customers are being served online and logging out at the end of the shift in the evening.

Another dimension is that businesses can scatter their workforce all over the globe even more easily than before. As the sun sets, the workforce in a different time zone can become active, serving customers in their own part of the world or dealing with night owls on the other side of the planet. The business thrives but so does the workforce, able to choose shift times to fit in with the school-run or their lifestyle, freed from the tyranny of time wasted travelling to and from a physical building, able to work wherever and whenever they choose.

> 'Already we at Google have developed a mobile version of our search page, so that consumers can replicate the same experience on their handheld device they would have accessed from their PC. As mobility extends the reach of the Internet even further, we will be able to step out into a whole new, open world of both information and business, accessible to us wherever we are.'

At the other end, for the consumer, it offers another kind of power, one that will have enormous social ramifications in more remote corners of the world. Already 41 per cent of online consumers are using search engines to find product websites, and once they can access that kind of information they are able easily to compare products, prices and availability. People who live in distant locations will be able to find out how much the local vendor has been weighting what he charges. When they connect to the Internet, they will be able to see that the same products are being sold for half the price elsewhere. Or perhaps they will discover that three new models have just been released onto the market, while local traders are still trying to offload out-of-date stock. It has already begun to happen in Asia. People in India, Thailand and China now know exactly what is in the global marketplace and are increasingly refusing to be a dumping ground for superannuated goods. Businesses will be forced to be more competitive as access to information has become global.

Google's business is to manage information and make it more accessible, so naturally we are heartened by this trend towards more and more access around the world.

Meanwhile the information world and the application world are beginning to move in step. It is not simply that information is there for us; increasingly we are able to exercise choice in how we receive it. As technology and access to information becomes more pervasive in our lives, people are seeking out solutions that are less obtrusive and can protect them from all the noise: Google is doing just that in finding relevant answers to their questions rather than bombarding them with information.

On the Internet, the walls of the garden we built all those years ago are tumbling down. Where the Internet leads, mobile hand-held devices will soon follow. It is already happening, and it is entirely possible that before too long mobile devices could overtake what is available on the desktop. There are already more mobile devices than fixed PCs.

Once the first sophisticated generation of mobile phones came onto the market, operators such as Vodafone and Orange played a pioneering role, just as Google had on the fixed line Internet, in shaping ways of making useful information available easily and digestibly on a small screen. They too began by setting limits, creating their own walled gardens for their customers, where people can access more limited but reliable content.

But now it is time to extend people's access to the forest further. People have become much more comfortable with accessing information via the Internet on their computers at home. They are more sophisticated about how to work out which information can be trusted; they understand how they can create their own lifeline networks, how to build a website or set up a blog. Now they are beginning to realise they could also do the same thing from their mobile phone or their connected PDA.

There are an increasing number of mobile devices that put you in touch with an exact 'Internet-style' experience, rather than a stripped-down version of it. Already, we at Google have developed a mobile version of our search page, so that consumers can replicate the same experience on their handheld device they would have accessed from their PC. As mobility extends the reach of the Internet even further, we will be able to step out into a whole new, open world of both information and business, accessible to us wherever we are.

For more information on Google see www.google.com

Real-time information at the bedside

Baldur Johnsen | Director of Information Technology,
Landspitali University Hospital, Iceland

Hospitals are part of a complex ecosystem, where specialised knowledge often resides in silos. IT and wireless technology enable a hospital to extend its boundaries to share such knowledge more broadly and to provide better patient care. The IT infrastructure at Landspitali is world class, and mobility is the natural next step. Baldur Johnsen explains how mobility – by bringing the right information to hospital staff at the right time – helps address some of the key challenges faced by the healthcare industry today. At Landspitali, the vision for mobility reaches as far as digital X-rays on handheld devices, a mobile blood bank, wirelessly prescribed and administered medication, order communication and managing chronic diseases from a patient's home.

The Landspitali University Hospital in Reykjavik is the largest acute care and academic healthcare institution in Iceland. It counts 3,800 full-time employees and has a capacity of over 900 beds. With 32,000 admissions per year and 16,000 surgical procedures, Landspitali consumes about 40 per cent of the Icelandic national healthcare budget.

Mobility is critical in hospitals. The workforce within a hospital is inherently mobile – a fundamental difference between us and healthcare centres or family practices where the patient comes to the doctor – and as hospital patients are mostly stationary in bed, all information resources must be fully mobile if they are to be brought to the patient's bedside. It is a challenge to make complex and often sensitive material mobile, so this is one reason why healthcare providers have generally been late in integrating IT technology into their work. Perceived security risks and technological limitations were major obstacles before wireless was as developed as it has now become. Stringent security requirements within the health services, meanwhile, have made many healthcare workers conservative – in short, they will always err on the side of caution rather than take what may be viewed as excessive risks with the handling of patient information.

In spite of this, though, the emphasis now is on ensuring all key work processes within hospitals are mobility-enabled. Most medical data is already captured by medical devices digitally; the goal is to enable rapid, efficient dissemination and interpretation of this information, both within the organisation and beyond to other healthcare organisations. The first step is to improve and adapt existing processes so that IT opportunities can be truly seized. Mobility then becomes the next logical step for all of us. We firmly believe that mobility will bring significant benefits for hospitals and fundamentally re-shape hospitals' organisational structures and boundaries.

There are many examples of how we are implementing mobility within the hospital. For example, we will soon have completed an eight-year implementation of an Electronic Patient Records (EPR) system; this will eventually lead to physicians using portable, tablet PCs to retrieve and manage data as they move around the hospital or consult at the bedside. By the end of 2005 all doctors should be able to check and share X-rays electronically. A further step is to retrieve these images onto a web browser for review on a mobile device. And we are looking at ways of enabling doctors to use WiFi capability to dictate or transcribe their patients' notes. We are running a pilot scheme to use mobility to automate the medication process. We operate a mobile blood bank connected to our central system through a wireless WAN link.

1.4

Our IT infrastructure is world class compared to most hospitals. Mobility, then, is our next step. Already we are piloting the use of PDAs with a readable screen – a great improvement: in addition to traditional infra-red communications they have WiFi and Bluetooth capability and also act as a GSM mobile phone. We are now looking at ways for physicians to dictate or transcribe their reports into this sort of device. We are investing in an Icelandic government initiative to develop an automatic transcription system.

'The first step is to improve and adapt existing processes so that IT opportunities can be truly seized. Mobility then becomes the next logical step for all of us. We firmly believe that mobility will bring significant benefits for hospitals and fundamentally re-shape hospitals' organisational structures and boundaries.'

Our mobility strategy is shaped by a number of key industry factors. The first is changing demographics. There's a direct correlation between the age of a population group and their level of healthcare expenditure. This is because there are two main 'customer' groups within healthcare: the under-fives and

the over-sixties. In most Western societies there is rapid growth in the size of this older demographic group. This puts increasing pressure on healthcare expenditure today. People are living longer and our healthcare spending has gone from 6 per cent of GDP in 1980 to 10 per cent today. The number of people aged over 60 has risen by 38 per cent over the past 20 years. So there seems to be a direct correlation between the number of people above 60 and the increased healthcare spending. The challenge for us is how to contain spending amounts and be efficient. The introduction of IT has demonstrated increased efficiencies in other industries, a key driver behind the process re-engineering concept. So there must be something IT – and mobility – can do for healthcare. This won't be about a single solution but a whole set of measures, such as changing work processes and changing the way healthcare is delivered. An excellent example of the latter is NHS Direct in the UK, which has demonstrated how providing information on the Web and via call centres can actually change the utilisation pattern of healthcare.[1]

1. An essay on this topic, by Dr. Anthony Nowlan, Executive Director of the UK National Health Service Information Authority, can be found in the publication 'Connected Health' of the same Thought Leader series.

The second industry factor relates to the healthcare market which, in terms of economic theory, is plagued by two market failures. The first failure is 'information failures' – the shortfalls in information that prevent patients from making choices as consumers of healthcare. Because of these information shortfalls, healthcare professionals make choices for us. The second market failure is what's known as 'moral hazard'. This means that healthcare providers are likely to supply more services than you might actually need because somebody else is paying for your care – an insurance company, for example, or central government. IT can help deal with both types of information failure and improve healthcare choices in the process. Already there is clear evidence of growing numbers of people using the Internet to find healthcare information. What is needed is the integration of elements such as clinical guidelines, evidence-based medicine and so on with EPR systems to facilitate the latest knowledge of care provision for physicians.

> 'Mobile medication decision support systems have already been shown to increase quality of care: statistics suggest 15 per cent of all administration of medication is somehow incorrect; automated medication systems can reduce adverse drug effects – due to incorrect timing of administration or incorrect dosage or even incorrect medication – by 80–90 per cent.'

Quality issues are also an important concern. A controversial statistic from recent US research shows there are between 44,000 and 98,000 deaths annually in US hospitals[2] due to preventable errors. This means that being

2. Institute of Medicine (www.iom.edu) and published in the book 'To Err is Human: Building a Safer Health System' (1999).

admitted into hospital is in order of magnitude more dangerous than flying on a commercial aircraft, for example. Whether or not you believe this statistic, the point is that quality failures must be addressed. In most cases, failures in quality are down to systems breakdowns rather than personal incompetence. So we believe we can provide care more safely than we are currently doing by improving systemic failures. The US's Institute of Medicine found that it takes 17 years for best practice to become common practice – so knowledge of new healthcare procedures takes 17 years to become embedded. Where we can have instantaneous access to information we should be able to speed up this adoption rate.

Acknowledging hospitals' positions within the overall healthcare 'value chain' is another key factor influencing our mobility vision. Hospitals do not exist in isolation – they are part of a larger and incredibly complex whole, an ecosystem. So we have to consider any IT initiatives that we undertake from two perspectives: the vertical and the horizontal perspective. If mobility is to work we must be confident it will work across all healthcare processes because all processes are interlinked. We talk about vertical systems or processes which serve a particular function within the hospital – radiology for example. And we talk about horizontal systems or processes which serve the organisation – such as EPRs. By making all these processes IT-enabled we can allow the physician to work at a workstation or even on a PDA or tablet PC to consult information at a patient's bedside. But to achieve the level of automation we aspire to we must have the mobile infrastructure. The concept of mobility, then, is a prerequisite for ultimate success in the provision of healthcare within the hospital environment.

1.4

The value proposition of IT in healthcare

Figure 1.

There are a number of examples of the different ways in which we are already putting mobility into practice. Digital X-rays is one. Mobile dictation and transcription is another. We've been using IP phones for over two years and are generally satisfied with functionality and coverage because it's a roaming technology. Recently we started a pilot project with the paediatric hospital involving the hand-out of GSM and wireless LAN-enabled PDAs to selected physicians, showing them how to browse for information. Using these PDAs for mobile dictation enables the automatic transfer of inputted information to a transcriptionist, speeding up the transcription process and enabling information to be made accessible far more quickly.

Two years ago we launched a mobile blood bank – a bus which travels around collecting blood donations. We moved the IT infrastructure of the blood bank on to the bus. It's connected though a satellite WAN link so we can travel anywhere to collect blood locally rather than requiring donors to come here. All of the blood bank's systems are online and fully integrated. Ambulances are another example where this sort of approach to mobility could be beneficial to hospitals – although in our case, this is a low priority as distances within Reykjavik, where we are situated, are not that great and easy to traverse. The point, however, is that IT infrastructure has to be truly mobile for IT to work best and we are making it so.

The administration of medication is another key area where mobility is playing a growing a role. When we created our IT strategy two years ago we identified two main IT projects that could help provide or support the value chain of the hospital. The first was EPR, and this is now being rolled out vigorously. The second was integration of many different, previously unconnected systems to coherently support the patient care process. One objective is to enable greater patient safety by automating the medication delivery process, from the doctor's order, through the drug administration to the patient at the bedside. In the process we free up nurses' time because much manual labour is associated with the tedious and error-prone activity of picking up pills from different packaging.

Figure 2. Hand-written medication order form.

A prerequisite for improving the medication process is to have mobile laptops – the laptop is wirelessly connected; the central information system is online. Once we have barcoding, or RFIDs for the nurse, the patient and medication dosage in place we're able to confirm or verify the actual administration. For this you need either a PDA which is equipped with a barcode reader or you have a system connected with a barcode reader. But the pharmaceutical industry is not providing us with unit dosage medication, which is barcoded so we need to barcode internally and there are technologies we can employ to do this. Only a small number of hospitals worldwide have yet achieved this degree of automation of medication. Our medication orders are entered by the physicians directly into the central system on a PC located in the ward. The nurses then print out a list containing the medication orders for each individual patient. They prepare the individual dosage from the list. When they do the rounds to administer the required medication, they walk up to each bed with the pills and a wirelessly-connected laptop, into which they confirm the information about the exact doses administered. This pilot has now been running 18 months and has required significant change management.

The potential benefits are huge, as the previously handwritten medication notes lead to a higher risk of errors in medication administration (see Figure 2). Another aspect of this is that we are now using software linked to the WHO monitoring research centre in Uppsala, Sweden, which delivers a real-time visual graph on the medication administration screen, showing all likely interaction between different medications. This means our physicians are made aware of how different medications react with each other at the time they make the prescription. Such mobile medication decision support systems have already been shown to increase quality of care: statistics suggest 15 per cent of all administration of medication is somehow incorrect; automated medication systems can reduce adverse drug effects – due to incorrect timing of administration or incorrect dosage or even incorrect medication – by 80–90 per cent.

1.4

> 'Mobility will change the very nature of the hospital as an organisation in the future, we believe. We will become more proactive in backing up other sectors within healthcare, distributing the knowledge embedded in the highly specialised expertise mainly concentrated within the hospital's boundaries today.'

Mobility will also become increasingly important to disseminate information – the ability, for example, to access the latest data immediately not just to alert but inform doctors of the latest lab reports for a particular patient which could lead to that patient being discharged earlier. Disseminating information directly to physicians wirelessly is a far more effective use of everyone's time:

to have a telephone conversation with someone interrupts the physician's activity and breaks their concentration, especially if they have to move to another location to find a phone. Given that most of the existing telephone traffic within our hospital relates to orders – collecting information, requesting drugs and so on – there is considerable scope for automation. Order communication is a very good example of how mobility can change the work process within a hospital.

Managing the expectations of people expected to work with wireless technologies is one of a number of challenges we face in implementing our mobility vision. You have to build an infrastructure capable of supporting and implementing mobility and most healthcare institutions are constrained in terms of finance. People have to assimilate new technology if it is to work – it has to become part of the culture. So you need to focus inward before you can focus outward. This is more of an organisational issue than a technological one. Politics is also a factor to take into account, given that in most countries, healthcare provision is governed by politicians who generally are elected for four to five years and the benefits of technology investment may take longer than that to become fully apparent.

Security is a major issue, too, and always a key concern within the healthcare sector because of the need to maintain patient-record confidentiality. With wireless LAN available in certain places we've had some teething problems in reaching the level of security we'd like with mobile and wireless networks. And there has been some employee scepticism, despite the fact that handling information in electronic form actually helps maintain confidentiality because we can track and audit who's been reviewing and accessing what. Such issues will be resolved, however – it's less a question of if, more when. Performance has been a challenge, too, but the technology is getting better in terms of coverage. Roaming was also an issue at one point. So a whole range of technical obstacles have also had to be overcome.

'Even though the hospital faces huge financial pressures, money is being spent on IT because hospital administration management has viewed IT as a key enabler to increase both quality of care and create more efficient processes within the hospital environment. This should translate directly to the bottom line.'

The cost of all this is a large challenge for any hospital, of course. Currently, we spend around 3.5 per cent of our total $350-400 million budget on IT – a fairly high figure. But even though the hospital faces huge financial pressures, money is being spent on IT because hospital administration

management has viewed IT as a key enabler to increase both quality of care and create more efficient processes within the hospital environment. This should translate directly to the bottom line. We've already demonstrated convincing cases that IT saves money – you end up with less resource usage, less usage of supplies and so on, which equate to hard monetary savings. For example, we recently began sending discharge letters electronically from the hospitals to primary care. On the assumption that printing out a conventional letter, folding it, putting it into an envelope and then posting it takes about 15 minutes per letter, we expect to save something like 13 man-years by automating the process through IT.

Another area we are keen to explore in the future is how to extend the service improvements delivered by our investment in IT and mobility beyond the confines of the hospital and into patients' own domestic environments to enhance after-care at home. This could lead to considerable benefits for the hospital as managing chronic diseases takes up an estimated 75 per cent of the national healthcare budget. We already have home services where we are trying to bring the hospital's services into people's homes. We're not initiating this with any specific technology yet; we're just looking at how to improve internal hospital systems and processes and what opportunities beyond the hospital these may bring. In this respect, we are considerably behind other industries, I believe.

Mobility will change the very nature of the hospital as an organisation in the future, we believe. We will become more proactive in backing up other sectors within healthcare, distributing the knowledge embedded in the highly specialised expertise mainly concentrated within the hospital's boundaries today. It's a way of sharing the burden and responsibility and will be more beneficial for the patient who does not live just around the corner. Accessibility to healthcare is a key economic issue. People have been talking about 'telemedicine' for some time, but so far the concept has been limited to specific services. In the future there will be much greater, more far-reaching change with organisational boundaries shifting and individual organisations – such as our own individual hospital – becoming a virtual state. The only limits, in our view, are cultural: how well people can communicate and ensuring the information they depend on is provided in a readily understandable form.

For more information on Landspitali University Hospital see www.landspitali.is

Protecting and serving New York City

Gino P. Menchini | Commissioner of the Department of Information Technology and Telecommunications;
Chief Information Officer for the City of New York

The City of New York is in the vanguard of developments in technology and mobility. The city must serve emergencies and daily operations equally well. Gino Menchini describes the numerous ways in which mobile solutions are helping the city in everything from first responses at a disaster site to health and building inspections, vehicle summonsing and ticketing, RFID tagging for routine task management. Wireless technology has also had a major impact on the working culture of many of the city's employees. The most ambitious wireless project yet is under way, which will enable common, wireless broadband access for all the city's emergency services.

The great metropolis of New York City, with about eight million inhabitants, is the nerve centre of the USA. It is a leader in manufacturing, foreign trade, commerce and banking, book and magazine publishing and theatrical production. The city employs more than 300,000 people in thousands of capacities at over 70 agencies. The role of the Department of Information Technology and Telecommunications is to oversee the city's use of existing and emerging technologies in government operations, and its delivery to the public. DoITT works to improve the government's efficiency through the use of technology.

September 11th, 2001, taught the City of New York some tough lessons. We had already begun to lay the foundations of the communications networks we now use, but our policy has inevitably been shaped by the experiences of that day. It has driven us to look for mobile IT solutions that will help us both in emergencies and in the everyday business of running one of the world's major cities.

We are now far better equipped to communicate between site and control centres during disasters. The first responders at the scene are able instantly and reliably to establish voice contact with key personnel, wherever they are, while at the same time downloading streams of information via handheld or vehicle-based receivers. We are no longer confined to communicating solely by voice, and no longer at risk of being unable even to do that should commercial networks become overloaded. We can bring into play communications technologies that operate from the scene and exchange real-time data with our outside command systems. As the situation changes, so do our maps and plans.

For example, we can go to an aeroplane crash site and bring in a mobile mapping centre, where computer facilities have the ability to hook up to high-speed Internet wireless connections as well as landline. Huge E-size plotters (36" by 48") enable us to collate and send out information on the spot: which blocks are affected, where the wreckage lies. We have the means to track precisely what is happening minute by minute. If there are victims, where were they found? How can ambulances most easily be directed to where they are needed? We can produce traffic maps there and then to determine which routes will be left open and which have to be closed, maps that are constantly updated by data and video imagery transmitted to commanders on the ground.

Identical maps are used both tactically by the people at the scene, and strategically to assist planning back at the command centre. They change with events in perfect synchronisation.

1.5

But it is not only in emergencies that the City of New York deploys mobile solutions. Similar technology serves the city in its everyday business. Even the Schools Department has mobile communications facilities, in Winnebago-sized trucks. Wireless technologies are now beginning to supplement our regular land-based networks as well as enabling data transfer from portable facilities. Our police officers use Blackberries to download information during vehicle checks. Our health inspectors are piloting hand-held devices to capture data and compile their reports. In the not-too-distant future, ambulances could take the telemetrics from a patient as they speed towards a hospital and transmit them ahead to alert medical teams what treatment to prepare.

How have we achieved this? It has been an evolving process of trial and error, and we are by no means at the end of it. In developing citywide IT strategies, New York's policy is to employ a highly federated model. My department has the overall control, but we keep only a light hand on the reins and allow each agency quite some freedom in determining the direction it wishes to go. Our infrastructure includes shared data centres, a centralised network of radio channels and telephony, and common development of applications in those areas where it makes sense to do so. But individual agencies such as the Police Department retain their own IT operations, focusing on dedicated technologies to help them pursue investigations. We may work with them to put central contracts in place, and

we may review their strategies, make suggestions and even to a limited extent guide the course they pursue, but essentially we allow them individual leeway. At inter-agency level we save development costs by helping build IT structures that can be shared by a number of departments, for instance creating tools for online payments or other operations common to several agencies. Increasingly, the tools and solutions we are exploring are mobile.

Contacting key personnel

For any large population centre, the main communications concern must be to find an easy and instant way to contact key personnel. This is vital in an emergency, when normal telecommunication lines could go down, or be overwhelmed by traffic, as they were on September 11th, 2001. In the first hours after the terrorists struck, commercial networks were completely overloaded. We had to revert to SMS and PIN-based text messaging.

We subsequently realised we had to find ways of prioritising Government communications during emergencies; it is unacceptable to be sharing communication channels with the public in such instances. We determined that we need a level of priority access, which is not guaranteed through private handsets.

'For any large population centre, the main communications concern must be to find an easy and instant way to contact key personnel.'

There are Government telephone services that supposedly offer priority access during emergencies, but as we discovered on September 11th those did not always work well. For example, we had a system used for landline phones. When all the lines were busy a particular number could be dialled as a prefix, giving the caller priority. We also had a priority cell phone for key personnel. Again the caller dials a code to override when cell networks are overloaded. Neither system worked as we had hoped in the aftermath of September 11th, but the cell phones have since been revamped and the Mayor, the Police Commissioner and other senior figures now carry these new versions. We also rely on satellite telephones to give us access to key figures wherever they are in the world, regardless of whether commercial networks here are working.

Although we extensively use commercial carriers such as Verizon, AT&T, and Nextel for voice communications, we also rely extensively on our own radio networks and have our own radio frequencies, so we can be wholly independent from all the wireless carriers.

Among our unique capabilities is a dedicated channel for the city's commissioners, to enable the Mayor to reach his senior personnel even in the event of a telecommunications outage. We can use it for command and control, to confer during major operations or emergencies.

We use other channels on the city's private radio network to communicate at all levels, in everyday business as well as during emergencies. For example, the Department of Transportation has push-to-talk walkie-talkie radios to keep in touch with its vehicles. The Fire Department uses walkie-talkies for dispatch. The same is true for the police and many other agencies. In the corner of my office is a mobile receiver scanning all the different channels, in the event that I need to respond to a situation anywhere in the city.

But our own radio network carries more than voice communications. Increasingly we are realising the value of being able to use the network to support data applications, and within that group of frequencies we have low-speed data capabilities. We can support mobile data terminals, such as the receivers that are in police cars for messaging. They are able to enter a licence plate to check the registered owner of a vehicle and what the summons record is.

The limitless possibilities of mobile data communications

One of the most exciting developments for local government in the city is the number of applications that are or will be accessible on handheld mobile computing devices, helping us in our daily functions.

Take for example building or health inspections. On a site visit to a restaurant our health inspectors can use a probe to test the temperature the food is being served at, loading telemetrics data onto a hand-held device. The same device could take and store photos, assembling many kinds of data directly into a case folder. These applications are still at a rudimentary level but we expect to expand them over time.

Meanwhile we are developing a handheld application for vehicle summonsing and ticketing. A barcode can be scanned on the car registration plate, triggering an instant download of all the relevant information about the vehicle and its owner. An actual summons can be printed on the spot. This will save time and money by reducing the number of tickets rejected because they are not technically correct, and will considerably boost our rate of fine collection.

The Police Department is now using Blackberries, so that patrol officers can perform warrant searches and driver's licence checks. Initially they had some safety concerns about using a keyboard to input data, rather than getting on the radio – would it make them an easy target for attack as they typed, or give an offender the opportunity to run off? So far, however, their fears have proved unfounded and the project has been extremely successful. Soon we may even be able to dispense with the keyboard, as voice recognition opens up an even broader range of mobile computing options.

Radio frequency ID offers us new ways to manage routine maintenance tasks. The Parks Department could have every tree tagged with RFID or a barcode; employees would check the pruning schedule for each tree on their rounds. We could apply similar technology to street lights, or any kind of fixed asset. And imagine how visitors might follow a route round different points of interest in the city, using an ordinary cell phone to dial a number and get an automated tour guide, describing what they are seeing and the history of the location.

Every city has a responsibility to keep its citizens informed. In an increasingly mobile age, we need to explore ways of getting public information out without overloading networks by having everyone call in at the same time. One of the most promising developments in this area is Reverse 911. It allows the citizen to receive emergency alerts and updates, via phone or text message on their cell phone or pager.

During a hurricane, for example, weather bulletins delivered in this way could track the progress of the storm. Suppose a chemical plant has been damaged and a plume of poisonous gas is drifting across the city: alerts could be issued to advise people in a particular area when to close their windows. In power blackouts, the latest situation report can be sent automatically to thousands of people at once. It is a technology that can be applied across any size of locality, in many different situations, and targeted quite precisely so that only those affected need be contacted. Instead of switchboards having to be manned and people having to call in to a hotline number, information could be sent out in a controlled way to everyone who needs to know.

Culture change for the city: boosting productivity and improving performance

Already we are seeing a massive change in the working culture for public employees. A number of developments have contributed to this, but one of the main factors has been the proliferation of wireless devices enabling senior personnel and the more technically minded to connect to the city's network wherever they are, whatever the time of day, gaining remote access to email, calendars and contact lists.

Many of our executive-level staff carry Blackberries, and this is already increasing productivity dramatically. For senior personnel it has doubled the amount of time we can work efficiently, and it may soon percolate down to the field force too. At two in the morning we could be answering emails. We no longer operate a nine-to-five culture in the city, and that has brought us closer in line with the way the rest of the contemporary world operates. When emails come in we respond the same day, rather than waiting for days to compose a letter or get around to picking up the phone.

This has been facilitated by the centralisation of our email systems. Until a few years ago, every agency in the city had to run and manage its own email environment. This has now changed, and we have standardised for all departments and agencies, using Microsoft Exchange with Outlook. Another change, from Virtual Private Networks to OWA – Outlook Web Access – has made it far easier for our users to access their emails from desktops at home or, for that matter, at any location with an Internet connection.

'Every city has a responsibility to keep its citizens informed. In an increasingly mobile age, we need to explore ways of getting public information out without overloading networks by having everyone call in at the same time. One of the most promising developments in this area is Reverse 911.'

However, although it would technically be possible now, we have yet to see any significant move towards telecommuting for civic employees. The only telecommuting I do is at night! Because our employees live within a geographically confined area, we would not gain any significant advantage in terms of reducing travel expenses if we were to encourage telecommuting. But there may be exceptional circumstances where it is useful to us: for instance if we have a key employee who is housebound by a medical condition.

But personnel like myself do move around between offices during the working day, and we can continue to be productive on the move because of pervasive wireless coverage across the city and within our buildings. At every new civic building, the site is wireless cabled. Throughout my agency, in almost every one of our offices we have built out wireless connections so we can be part of the enterprise network.

Connecting the city – the pros and cons of hotspot provision

How proactive should we be in building a broader residential and commercial telecommunications infrastructure for the city?

We have recently become the first city in the US to grant franchises for companies to erect antennae on our street lights and our traffic signals. Six companies have already begun supplementing the cellular service in this way, but the terms of the franchise allow them to handle any type of wireless application or traffic. One company is planning to implement an 802.11 based solution to provide Voice over IP to customers within the catchment area.

Should we follow Philadelphia's example in developing a citywide hot zone strategy and provide wireless services ourselves? So far we have stopped short of this. We have some 'hot spots', but our belief is that this is not the business of local government, which is rarely efficient in offering services that can be provided by the private sector.

We are happy however to encourage others to provide wireless technology for New Yorkers to use, if we can be satisfied it will not violate our restrictions or create an unfair advantage for a single supplier. Indeed we welcome the revenue we raise from franchise fees. But statistics suggest there is still only a relatively small demand for these services. Through the Lower Manhattan Development Corporation, some of our parks have been 'lit up' as hot spots. Usage reports indicate take-up there is remarkably low. People don't go to the park to use wireless technology. We have also allowed an operator to install hot-spot technology on their public pay phones. But usage so far is low and they are now scaling back to about half the number of hot spots planned.

'The largest public safety wireless network anywhere in the world will provide our emergency services with broadband access to information such as mugshot and fingerprint archives, or building floor plans.'

There are also health issues to consider. Some council members are concerned about rooftop cell towers; does microwave radiation of this kind present a health risk to workers or residents within the building? Our position is that we must balance the needs of business and domestic users with the public safety concern, especially now that so many people rely exclusively on cell phones for telephone service. A robust infrastructure for wireless technology is more and more essential, and we continue to actively explore ways of encouraging the development of environmentally safe wireless provision for the city.

What everyone aspires to for mobile technology is higher speed and lower cost, supporting the broadest possible range of applications. We are aware that at present our mobile data capabilities are limited. Our intention is to remedy that in order to push out far higher amounts of data and even video imaging to our agencies, and to the first responders on the scene of an emergency. To that end we are planning to upgrade our capabilities with a project that is likely to cost many hundreds of millions of dollars, deploying a dedicated high-speed broadband wireless network across the city.

This will be the most challenging and most comprehensive wireless project so far envisaged: the largest public safety wireless network anywhere in the world. It will provide our emergency services with broadband access to information such as mugshot and fingerprint archives, or building floor plans. We could also use the network to control traffic signals and support a vehicle location system. At the same time, tens of thousands of mobile users throughout the city will reap the benefits, by being able to send and receive data even as they travel at speeds of up to 70mph.

Conclusion

Increasingly New Yorkers are turning to mobile solutions in their businesses and in their private lives. The city too has embraced the opportunities mobility offers us. This latest project will not only immeasurably assist us in the day-to-day management of our many tasks; it will establish us as world leaders in developing pervasive wireless connectivity to benefit and protect our citizens.

If I were asked to predict the kind of technology that will push us even further forward, my guess would be that interactive voice and hands-free operations are going to be the next major development in mobile computing. We live in exciting times. Whatever the future holds, New York City intends to be in the vanguard of the march towards it.

For more information on NYC's DoITT see www.nyc.gov/doitt

Spreading the news

Geert Linnebank | Editor-in-Chief, Reuters

Geert Linnebank explores how mobility is revolutionising the news industry. Not only does it change the way journalists are able to collect news and information worldwide, but the choices for the consumers, in the way they receive the information, are expanding.

Reuters, the global information company, provides information tailored for professionals in the financial services, media and corporate markets. Its trusted information drives decision-making across the globe, based on a reputation for speed, accuracy and independence. Reuters has 14,500 staff in 91 countries. This includes 2,300 editorial staff in 196 bureaux serving 140 countries, making Reuters the world's largest international multimedia news agency. In 2004, Reuters Group revenues were £2.9 billion.

If there is a single metaphor that sums up what has happened in the information marketplace over the past two decades, it must be that of the butterfly's wing whose motion sets off a typhoon on the other side of the world. Linkages that were undreamed of perhaps only ten years ago are now not merely a possibility: they are routine. It is not only the amount of information available that has increased but also, exponentially, the speed of its movement across the world.

For an organisation like Reuters, this has revolutionised our ability to serve both existing customers and new markets. Yet it has also allowed us to preserve the essential Reuters values of truth, accuracy and speed. Alongside accuracy, timeliness has always been the driving force behind Reuters: getting the story out *now* and getting it to the customer *fast*.

Reuters is one of the most venerable journalistic organisations in the world, founded over 150 years ago, and the largest of its kind. We like to boast we have always been at the leading edge of information technology. When Paul Julius Reuter started the business in 1850 our delivery system was nothing more sophisticated than the humble carrier pigeon, but within the first ten years of operation we were already investing in the development of the hottest technology of the time: the telegraph line network. In the late 1850s Reuters built its own telegraph line from Liverpool to London, to speed up the time it took to get news and business information from the country's industrial heartland to the main financial markets in the City. Then, in order to steal a march on our rivals, we built another private telegraph line from Cork in Ireland to London. Reuters's correspondents in the United States would send their reports by steamer across the Atlantic. The dispatches were thrown overboard as the steamer passed Cork and collected by local fishermen, who delivered them to the telegraph office to be transmitted to London well before the ship had docked at Liverpool. This arrangement earned Reuters one of its early high-profile scoops in its home market, giving those newspapers who subscribed to our service the news of President Lincoln's assassination a full day ahead of our rivals.

> 'News is a fiercely competitive business and rather like an arms race, the rivalry that exists between rival news organisations has always helped to drive technology adoption forward. It is essential to stay ahead in order to stay in the game.'

1.6

If rivals come up with a new device, you must match it, and preferably surpass it.

To its thousands of customers in the news media, Reuters is a wholesaler of information. We have bureaux in close to 200 cities around the world, covering 140 countries. These are staffed by around 2,300 reporters, photographers, cameramen and women, whose job it is to gather and edit the news wherever it is happening. Their tools today are notebooks and cameras, just as they always have been, but now the notebooks are electronic and the cameras digital. On the ground our journalists make an initial selection of material that they then send through to one of our three main editing centres, in Singapore, London and the United States. There the news will be checked, edited and then packaged up into the products we sell: news and information services, tailored for specific customers. Organisations such as the BBC, the Wall Street Journal or the Yomiuri Shimbun take the stories we write and the pictures or video footage we provide, and repackage it in their newspapers or broadcasts.

The majority of our customers, however, are in the financial services industry, where Reuters earns over 90 per cent of its revenues. Not only do our financial clients want to be kept informed about the price movements of

stock and currency, they also need up-to-the-minute global news to support the decisions they make. An oil strike in Nigeria, strong new economic growth figures in China, election results in Iraq, disruption in commodities because of conflict or disaster: all these may impact on their business, and they must have the information as soon as possible. Connectivity dictates every step of this process, from news capture to delivery.

News capture in the field

The most revolutionary development for our news-gathering operation in the past ten to 15 years has been the time and cost savings made possible by the miniaturisation and portability of the equipment. The traditional romantic image associated with journalism is the lone reporter, notebook tucked in the pocket, capturing the story single-handed. The late 20th century reality was just the opposite. Newsgathering in the television age often took large teams, carrying truckloads of equipment. Sometimes an organisation like ours might send four or five people to the same event: reporter, sound technician, cameraman, stills photographer and producer.

Now, we have come full circle. A single journalist can once again operate alone, but on a far more sophisticated level, in some cases being able to collect still images, audio and video, as well as making notes to work up into a story. Raw digital images – still and video – can be transmitted via a laptop and wireless LAN, GPRS, the Internet, or satellite phone. Clearly this is much cheaper for us, but it also means the reporter can get access to places and stories that would have simply been too expensive or logistically difficult to cover in the past.

'An oil strike in Nigeria, strong new economic growth figures in China, election results in Iraq, disruption in commodities because of conflict or disaster: all these may impact on businesses, and they must have the information as soon as possible. Connectivity dictates every step of this process, from news capture to delivery.'

There are still many occasions where we want to – and do – send a professional photographer or videographer, but even their equipment has become far easier to handle in the past few years. Professional video cameras have become smaller and simpler, reducing the cost for us. They also bring another huge benefit: increasing safety for crews operating in battle zones. Using a traditional large shoulder-held camera represents real danger in war zones, because they can be mistaken for rocket launchers. Now we equip our teams with smaller handycams. They are impossible to mistake and the quality is now almost indistinguishable from larger professional formats.

Nor do stills photographers on assignment have to carry portable darkroom equipment, as they once did. Indeed our last darkroom was shut down several years ago. It was at the 1998 football World Cup where we were first able to demonstrate the power of digital imaging combined with wireless LAN, set up in the main ground. As soon as a photo was taken, using a digital stills camera, it was downloaded onto a laptop and transmitted instantaneously via wireless LAN to an editing desk capable of pushing it out directly to our customers. Within five minutes, we could send pictures of World Cup matches anywhere in the world, virtually as they happened. For our Far Eastern newspaper customers, this was groundbreaking. Until then, they had not been able to carry same-day pictures of matches being played in another time zone, because it took so long to process pictures in the traditional way that they arrived long after the print deadlines.

News frequently breaks in the most inconvenient of places, corners of the world where communications are, to put it politely, in their infancy. Previously the problem was how to get information from remote locations quickly into the Reuters network. Reporters were dependent on the local telex or telephone system; sometimes, they had to find a friendly air hostess and persuade her to carry precious videotape out of the country. The initial phase of the revolution for us came about 15 years ago, when portable satellite technology first became available. News teams could set up a dish wherever they were, point it at the satellite and send both words and pictures instantaneously back to base.

1.6

But there was a drawback: the sheer size of the gear. Crews would be sent out staggering under the weight of huge, cumbersome dishes and generators. If they were sent to cover a big sporting event or conference, the satellite equipment might weigh hundreds of kilos. We spent literally hundreds of thousands of pounds a year just on excess baggage on commercial flights. Crewing was costly too, with an engineer required to just set up the dish.

Today, miniaturisation has enabled us to operate at a fraction of that cost. Our reporters carry devices no larger than a laptop, with which they communicate straight to the edit desk. The equipment gets smaller all the time and we are already equipping our staff with lightweight Thuraya satellite phones – no larger than a normal mobile phone. The cost is tumbling, and where we had five portable units in the field 15 years ago, today we have hundreds. Almost every reporting bureau in our organisation now has the technical capability to collect and transmit text and pictures from field to edit desk instantaneously. Camera operators, using a lightweight camera and a laptop, can shoot, edit and send a story over the Internet in minutes, from Kinshasa, Kuwait, Khartoum or Kathmandu. The story can unfold in front of your eyes, wherever in the world you are.

These developments have created the appetite and indeed the expectation that news must be available to the consumer as it happens, in real time. During the Iraq war, our commitment to cutting-edge technology again gave our journalists an advantage. We had about 70 reporters and camera operators on the ground, 30 or so embedded with American or British units. Our reporters were equipped with lightweight Thurayas. These can switch between GSM and satellite; the phone can simply be pointed skywards and it connects with whichever access technology is available, allowing the story to be transmitted on the move. This proved invaluable, since the army units understandably were not prepared to stop just because they had journalists with them who needed to send a story.

At the same time, nothing changes faster than news, and it is vital to keep journalists on the ground abreast of recent developments. So these systems also allow the edit desk to communicate back to the reporters to provide them with relevant updates. For example, if George W. Bush announces a new initiative for Iraq, the Reuters journalist in Basra can be contacted and briefed within minutes.

A secondary impact of the evolution of mobile technology is the erosion of distinctions between professional and amateur. A telling example is the reporting on the devastating tsunami that hit South East Asia in December 2004. The images that the broadcast media showed were often supplied by ordinary people, holidaymakers with digital stills or video cameras, and even mobile phones, capturing the horror of the moment as the waves swept towards them. Nothing could have replaced the raw impact of those shaky, blurred images.

This certainly doesn't spell the end of professional reporting, but it does confirm a need for the trade to collaborate with the public, since raw information is increasingly available to anyone. The backbone of an organisation like Reuters will always be made up of professionally trained journalists and photographers. The non-professional source adds colour and immediacy, while our own known and trusted reporters are there to validate the story. There are still some very real risks with this approach; media organisations have to be wary of hoaxers. The challenge is to find a way of using these new sources of material while maintaining professional credibility. As long as the Reuters brand confers authority, especially in the financial markets, we will always be at risk of being targeted by rumourmongers who want to use us to their own commercial advantage. Our policy is to keep the editorial process in-house, filtering and checking the material we receive. It is vital to convince our customers that they are not buying unsubstantiated whispers, but validated information based on eyewitness reporting, background knowledge and expertise. We need to be vigilant to ensure we balance this 'quality seal' with our customers' desire for immediate information.

Delivering the news to the customer in the financial sector

Today's consumers of news insist on immediacy. Their expectations have been shaped and driven by the development of the Internet. The appetite for real-time information in the financial sector is greater still. Markets are increasingly news-sensitive. Anything from an interest-rate change to a political assassination, an unpredicted company result to a natural disaster, can send prices soaring or tumbling.

Once again, organisations like Reuters look to new forms of connectivity to move ahead. In Germany the 3G network is noted for its reliability. There we have been able to use it to speed up our reporting of financial press conferences. The problem was that reporters were not allowed to use mobile phones inside the room where the press conference was held. Each journalist at a press conference of the Bundesbank or the European Central Bank, for example, would have to make a few rushed notes about European inflation rates or interest rate trends, then run outside to phone a news alert through to the office, meanwhile risking missing the next crucial piece of information. Often the only way to ensure successful coverage was to send in two or even three reporters, who would effectively operate in relays. Now we equip reporters with 3G-enabled laptops, so they can sit in the press conference and report what is said via a 3G connection for instantaneous transmission, without leaving their seat. At the time of writing, it has given Reuters the edge, yet so fiercely competitive is this field that within a short while our rivals will almost certainly have adopted the same practice.

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'Often the only way to ensure successful coverage was to send in two or even three reporters, who would operate in relays. Now we equip reporters with 3G-enabled laptops, so they can sit in the press conference and report what is said via a 3G connection for instantaneous transmission, without leaving their seat.'

And it is not just a case of speed. Digital technology enables us to offer far more than raw numbers or facts. Financial customers may buy access to the latest stock or currency prices, but along with that they get tools to analyse price movements, and even the ability to transact over the electronic network.

About 30 years ago we led the field with a system called Monitor, effectively a precursor to the Internet. Previously the currency market had been a telephone market, small and restrictive. Reuters created an electronic marketplace that gave full visibility to the bids and the asking prices for each currency. It was possible to watch price movements on your screen, analyse the implications, make an immediate decision to buy or sell, and then

transact over the same proprietary Reuters network. The effect was that the currencies marketplace became uniquely time-sensitive, in a way that the stock market and the commodities market at that point were not – using Monitor technology, it could take as little as five seconds to enter a multimillion dollar currency deal on the system, and to complete the transaction.

Now other financial markets have followed suit and are almost equally time-sensitive. Reuters is one of the players. With Dow Jones, Bloomberg and a number of others, we are locked in fierce competition to get increasingly timely information out to people in the financial marketplace so that they can trade in a way that gives them an advantage. Putting the markets onto an electronic platform has dramatically increased the competitiveness between Reuters and other journalistic organisations, and the race, as ever, is to be first. Mobility has taken this even further.

Mobility and personalisation

New mobile platforms have revolutionised the way journalists are able to collect news and information. But the possibilities for the consumer, in the way he or she chooses to receive the information, are only just beginning to be tapped. The technology is developing all the time, and it is irrelevant whether we are looking at Blackberry or Pocket PC, WiFi or GSM. New demands are dictated not so much by the platforms themselves as by the manner in which people are beginning to use them. Increasingly, organisations like ours are looking to develop personalised services to individual customers: something bespoke-tailored and adaptable to the customer's needs.

The financial services industry as a whole is still centred on the office environment, and will almost certainly remain so for the foreseeable future. Nevertheless, the industry is made up of individuals who may not be tied to their desks. It is pointless to treat a mobile platform in the same way as a 'tethered' product, designed for a desktop system with greater processing power and larger screen size. We see the next generation of mobile services as *companions* to desktop services, rather than replicas or replacements.

A mobile device is often intensely individual to the user, carrying his or her personal address book and scheduler. The next generation of services could offer linkage between these; if for instance you have fixed a meeting, you may want your mobile device to pull down information about the person you will be seeing, or background on their company. The service could also be adapted to the time of day. At the beginning of the day, on the way to the office, you will be looking for the kind of information that primes you for the day ahead. In the middle of a trading day when the markets are open, you may want to be able to transact, as well as keep an eye on what is going on locally and globally. But late at night when the markets are closed, your needs will alter again.

Many of our customers travel extensively, and the mobile device could signal where they are, changing the information to suit. You may normally be based in London, but when you travel to Singapore or New York, your mobile device or notebook will offer a different view of the world that reflects your location.

> 'We see the next generation of mobile services as companions to desktop services, rather than replicas or replacements.'

As part of the service people buy into with Reuters, we make arrangements with providers of access points to extend the reach of the network. A subscriber can go to a Nero or Starbucks coffee shop in central London, for instance, where there is a WiFi hotspot, set up their laptop with a latte at their elbow, and VPN – through to the Reuters network. This could work wherever you are in the world; we even have a deal with a provider of dial-up access in Mongolia.

The opportunity for personalisation has implications for the way in which companies like ours deal with business customers. Traditionally, Reuters has done company-wide deals through a single buyer within an organisation. But behind that single buyer are hundreds or thousands of individuals, with different roles within the company, different working habits, different preferences. With mobility, services are becoming more and more personalised. Hence we need to build a relationship with each user or at least user group, as well as give them a voice and a choice in the way our services are tailored to suit their very own needs and ways of working.

It is not only the financial or business customer who will benefit. Similar services can also be directed towards the ordinary consumer: 'world citizens', as we call them, people who want to be informed and keep up with global affairs. So far we have made partnerships with Vodafone on 3G, for instance, and other telecommunications companies worldwide. Information can be delivered via SMS, or the mobile can provide filtered and targeted access to websites, depending on the profile of the user. Usually these ventures are funded from advertising, though for some there is a nominal subscription rate. The key is to develop a close relationship with the consumer, to understand what is important to him or her, and effectively 'super-target' our services.

The dynamics of the news business are very different today than they were a decade ago. The speed at which news floods in, and its sheer volume, is both exhilarating and daunting. The consumer is almost drowning in a sea of information. But mobile connectivity enables us to explore exciting new possibilities for personalised information services. In the revolution to come, we will know about the butterfly's wing at the instant it begins to flap, and the typhoon it unleashes will no longer catch us off guard.

For more information on Reuters see www.reuters.com

Providers of mobility

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Reshaping business models

Andy Mulholland | Global Chief Technology Officer, Capgemini
Mal Postings | Global Lead for Mobility and RFID Solutions, Capgemini

Andy Mulholland and Mal Postings reveal the ideas and attitudes needed to navigate a rapidly changing business environment. They look at the problems faced by companies that are restrained by linear processes and argue that mobility must bring business and technology together in a collaborative approach. Building on examples from a wide range of industries, they show how, at this evolutionary phase of new-technology adoption, niche operations can have a stranglehold in key areas. They make a compelling case for embedding knowledge within the business process.

Capgemini is a global consulting, technology and outsourcing firm with approximately 59,000 people operating in 30 countries worldwide. With 2004 global revenues of €6.3 billion, Capgemini is one of the world's leading global consultancies. The firm helps businesses implement growth strategies, leverage technology and thrive through the power of collaboration.

There is a clear increase in the number of companies that are looking for an enterprise-wide mobility solution. Perhaps as recently as 18 months ago, mobility wasn't even on most companies' radar. Now, the CIO is being handed reports of an isolated pilot here, another there, 300 users in this territory, 50 in that one, some using technology X, others Y. These projects have mostly been carried out autonomously, with minimal if any change to the core IT infrastructure. The impact of these pilots is now becoming clear and the CIO is starting to have visions of improved benefits, return on investment, productivity gains and increased customer satisfaction.

The mobility market is heating up rapidly. Companies are projected to spend €50 billion over the next three years on mobility solutions with an annual compound growth rate of over 44 per cent (IDC, 2002). Ninety-two per cent of companies are kick-starting initiatives. Ninety-seven per cent are increasing their spend, and of those, 60 per cent are spending over €500k on a typical project. Mobility is clearly on the move.

So how do you plot a course through this rapidly changing environment? The problem we find is that too many companies are restrained in their thinking. Everybody's still talking about linear processes: business-to-business, business-to-consumer, business-to-employee and so on. There is also no substantial new thinking within the typical MBA management models and methodologies like Michael Porter's value chain, C.K. Prahalad's 'core competencies' and the Balanced Scorecard which are almost 20 years old now. We need a more business and technology joined-up way of viewing the world. For mobility we have developed the 'Mobility Service Grid' that has at its core four different architectural dimensions: Enterprise, Marketplace, Device and User.

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> 'The impact of these mobility pilots is now becoming clear and the CIO is starting to have visions of improved benefits, return on investment, productivity gains and increased customer satisfaction.'

The Enterprise could be AXA, British Airways or your company of choice. The Marketplace is like the Yellow Pages, a host of organisations with service level agreements, pricing structures and so on.

You need a bit more imagination when you get to the Device, because we're not simply talking about mobile phones or laptops. It could be a car, a network-aware apartment, a fridge or any kind of device, running any kind of operating system, whether it is a Java Virtual Machine (JVM) or a Windows CE-style operating system.

And of course, you have the User. It may not seem intuitive that the user and the device are separate, but they are and this is fundamental to achieving the full potential of mobility. For example, say that Shell offers me a 10 per cent discount on fuel for the next two months. The car doesn't come into it. The offer is made to me, so this is definitely an enterprise-to-user communication/promotion. Under different circumstances, that offer could be made on an enterprise-to-device basis. If I'm on the road and my vehicle telematics signal that I'm running near empty, the car can broadcast that requirement to the marketplace, giving its current location and stating, in effect, that it's now in the market for fuel and asking which enterprise (fuel station) can make the best offer. It doesn't matter who is driving the car, it's the car that's actually communicating.

The Mobility Service Grid model is not just about semantics. It's a practical tool. It gives you a workable number of relationships – about ten in fact –

which can not only be used as an analytical approach but can also lead to the suggestion of entirely new services. In practice, we tend to map out our client's requirements in true business consultancy fashion first – business process, business service and so on, identifying the various processes involved in each area – representing an 'as-is' position. Then we take a step back and use this methodology as a basis for further enquiry: what do you need to do as an enterprise? What could or should be done by the marketplace? What could be done by the user? What can be done by the device? You soon find yourself putting the project into context, considering a number of options that you can evaluate in different ways, ie is this process really a differentiator? Is it going to earn any money in the future? Etc. This is much more aligned to a service architecture way of viewing the business – and again will help in defining the bridge between the business processes (service) and relating technology needed to satisfy these services.

'Competitive advantage is beginning to drive mobility, but for many the basic requirements are still in the driving seat. Maximising the return on assets is another frequent example, but most of the time it's a simple people-focused issue.'

But often companies do not start adopting mobile technologies because they are visionaries or because they can see long-term potential. They're usually more driven to do so by some basic and easily identifiable requirement: employee productivity in a particular department, for example, or a reduction in back-office admin.

Competitive advantage is beginning to drive mobility, but for many the basic requirements are still in the driving seat. Maximising the return on assets is another frequent example, but most of the time it's a simple people-focused issue. If mobility gives a travelling salesman more time to do his job while he's on the road, then all of a sudden he doesn't have to spend from 4.30 in the afternoon until seven in the evening doing paperwork.

Another frequent example involves compliance. Make the salesman more efficient and you can drive up sales, but foul up your compliance and you can lose your business. The problem is exacerbated because a lot of compliance is currently heavily paper-driven. To take Shell again as an example, in the Netherlands they simply cannot implement all the compliance measures using a normal paper-based admin system. We developed something very simple using an online database on a PDA that presents a workflow for compliance, enabling employees to go on their rounds and use a check-list. Compliance sorted out and cost savings into the bargain.

Unfortunately, despite the obvious possibilities, the adoption of mobility has faced a number of major challenges. The first inhibitor has been the global economic downturn, putting pressure on discretionary IT spending. One of the results of this has been an increase in the importance of outsourcing. A lot of companies are saying that having gone through the Internet revolution and suffered a great deal of heartache by re-inventing the wheel internally, it's easier to outsource from the start. Especially now that desktop outsourcing and managed service provision is seen as normal – the extension in this service to cover enterprise mobility devices is a natural one. The issues for procurement, provisioning, support, maintenance and end-of-life are all costly and time-consuming and are not 'core' for many companies.

Next, you have cultural issues. Some employees may feel that they are being watched too much and no longer enjoy the freedom they had to organise their daily work routine. And others may feel compelled to now be available 24/7, actually reducing the amount of free time although the mobility solutions they enjoy should in principle have the exact opposite effect. Many organisations feel that these cultural issues are a significant inhibitor to mobility.

From an IT point of view, there are also significant technological barriers. First, of course, you have network performance, but this is being addressed steadily by the prospects of 3G. More seriously, many mobile solutions involve unfamiliar technologies: a new operating system, hardware platforms, or more esoteric issues such as the agent-based applications that come into their own when you have device-to-device communication.

The result is that a lot of CIOs and CTOs we speak to see the area as still emerging and not yet mature. They are expecting to find a robust mobility solution from the large, reliable players – but they often can't, because these are still mainly in development. This in turn leads to another problem: the solutions that *are* out there tend to come from small players. We're in that evolutionary phase of new technologies where niche operations have a stranglehold in certain key areas. Clients are impressed by – and desperate for – the solutions, but are still nervous about issues on scalability from the niche providers in the market today. This phase probably won't last long: we expect to see more consolidation within this market. In the meantime, there's an interesting market dynamic.

If you're courageous, there are some smart deals to be done in this environment. From a Capgemini point of view, it's a full circle: at one end, we're dealing directly with 500 clients globally; at the other, we have small ISVs coming to us for a mantle of respectability and scalability, with technologies that attract a great deal of attention from the larger clients. And in the middle, we also have partnerships with the Telco Service Providers – who are providing voice but need to partner on mobile enterprise, and with the OEMs who want to sell more handsets but need m-commerce solutions to attract the clients… which takes you back to the beginning of

the circle. The small ISVs are hot: their concepts and technologies are a driving force, but they're not big enough to provide the fully managed service that key clients require. So here Capgemini looks at providing a collaborative approach with an ecosystem of partners to guarantee a best of breed service.

These managed services are essential because of the need for security, which is becoming more significant – especially where device-to-device communication is concerned – and compliance. Wrap these issues up with the challenges outlined above and you have a strong need for a service that goes from procurement and provisioning, through call centre support and maintenance, to end-of-life management. For example, a number of companies, Capgemini included, have set up managed service offerings based on a cost per user. A client wants 5,000 devices? We might quote, say, €70 per user per month, to include cradle-to-grave management of the device and user support. This further helps by shifting the whole exercise over to an opex model, reducing the high capex costs that would otherwise be involved in operational development and support.

So, what are the real benefits you get from mobility? The first is obviously the ability to work remotely. We all understand that.

Next, you have real-time information sharing, which ties in with traditional areas of knowledge management. Out of 900 top US executives, 56 per cent cited remote access to critical information as being of major strategic importance to their business (Larstan Business Reports/Cap Gemini 2004). Imagine a future where more contextual, real-time data can, with the right software, be visualised more effectively and in real time. Rather than wait for the end of the quarter to get your balance sheet, check the P&L, asset count, utilisation and cash flow, you'll have a group of departments, each offering and consuming services and operating with their own minute-to-minute reporting structure. The performance view of the business of the future can be imagined as a graphic equaliser, showing service success and asset utilisation on a near real-time basis. Here you will have the option to manage the attached SLAs dynamically to reflect the current business objectives. Your quarterly management meetings no longer have to make dubious assumptions about performance until the next quarterly report: instead, you can focus on the overall health of your business, confident that you will always have your finger on its pulse. You'll be able to make better decisions, quicker. Here you will be in tune with the rhythm of your business.

The third area is context-aware processes and, especially, location-based services. This is where the real growth is going to be and we're starting to see a hint of its potential already. For example, we're working on the bid for the Olympics in Beijing in 2008, devising security systems that will use location-awareness for security. Whether you're in the Olympic Village or arriving at an airport, you can have real-time access to information on the

nearest restaurant, the nearest ticket office and so on. It can all be automatically provisioned onto the mobile device based on where you are and linked to authorisation privileges.

Another example of our own: we operate a special training and education 'university' close to Paris, which we frequently rent out for external board meetings and corporate training. We considered having a space there that we could call the 'mobile demo room', where visitors could check out the mobility services we offer, but that would have been a bit 'old school'. Instead, we are integrating mobile services into the running of the whole division.

> 'Context-aware processes and, especially, location-based services, is where the real growth is going to be.'

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Visitors will get a Nokia Communicator on arrival which, together with pervasive WiFi coverage, provides not only all the data they need – here's your timetable, here's where you need to go and so forth – but does so in a real-time and location-aware manner. You may, for example, have a special meal requirement, in which case you'll find yourself receiving it without being asked. And the tutors have found it helps enormously: instead of marshalling their trainees in a single room, they can disperse them throughout the various libraries and support centres, where they can get the resources they require, yet the tutor can still communicate with and manage them. From a personal point of view, it also means that trainees can find each other easily. On arrival they can quickly link up with colleagues: a solution, in fact, that we're now promoting to hotel chains.

These initiatives are going to become more and more pervasive. A doctor is doing his rounds in the hospital. His mobile device downloads all relevant information for each patient in turn as he approaches their bedside. The nurse beside him also has access to this information but presented in a manner appropriate to her work function. This is currently done over IP networks, not GSM (although it could be used on wide-area networks) using access points and triangulation to fix the device location.

Meanwhile, back in surgery, another doctor is meeting a new patient with a particular condition. New research on treatment for this condition is coming out almost every day. Doctors simply do not have the time to track this data and, even if they did, they could not manage their time effectively because they have no means of knowing what conditions they may be faced with tomorrow, let alone next week. But using a push model, relevant drug therapy information can be delivered to the doctor on demand, in real time.

Innovations like these are going to change the way we do business. At the moment, knowledge is seen as a separate repository, disconnected from the

business process. What you need to do is embed the knowledge within the business process: as the doctor moves from surgery to ward to bedside, his information device navigates down through different levels of data and presents them to him appropriately.

This is an excellent example of mobility at work, and, it's significant because it's a device-to-device process at heart. This model is going to drive a great deal of innovation and business change in the near future. For instance, enterprise-to-device applications like an airline company remotely updating a PDA with a change in flight schedule will have a tremendous impact on business models in the mid-term. However, the technology for enterprise-to-device isn't quite there yet. At the time of this writing, it's probably still two years out.

For the time being, device-to-device is going to be firmly in the driver's seat. RFIDs are taking intelligence right to the edge, right to the front line of the business process. For example, you currently gather information on the shop floor, filter it out and send it back to your ERP system where it will be subjected to maybe twice-weekly logistics cycle for purchase pattern analysis prior to re-ordering. Intelligent devices are going to do away with all that and are also going to offer a wealth of other possibilities right at the edge (point-of-sale).

To take another example, imagine a haulage company that has all its assets out on the road 24/7. We've designed a system whereby each unit 'calls in' on a regular basis with its position and percentage utilisation. This information used to be processed by human controllers, matching client locations, loads and destinations with the current state of the network. Now we use agent-based technology to do the job, significantly reducing the client's call centre staff while at the same time adding a 25 per cent improvement to the bottom line by maximising the utilisation. The agents work on goals that can be adjusted by the staff – to reduce delivery times, for example, at the expense of loading, or to use the minimum number of vehicles, laden to capacity, at the expense of delivery times.

A new model for business

Once you have device-to-device intelligent communication, then device-to-enterprise communication begins to deliver knowledge resources and enable process management in entirely new ways. This is just one emergent property of mobility that will force a shift in business process design: a move towards a service-oriented architecture state.

We're accustomed to thinking of our businesses in linear fashion: you start here on the value chain, you end here. A service-based architecture coupled with device-enabled technologies gives you a new way of looking at a business that may, in the future, be described as a 500-service-based company, a 50-service-based company, etc. Every company will define itself in terms of the services it provides.

Device-to-device communication is going to play a major role in this transformation. Take what's happening today with RFID and the supply chain. You have a raw-materials supplier, a manufacturer, warehousing, and retailer with a logistics company managing the transport between them. Today, all of these organisations are having to declare their inventory and its location, pass it on to this company, then on to that one… and all the time they need to track-and-trace the product.

Now, take the pharmaceutical supply chain of the future. A vaccine is shipped from manufacturer to pharmacy. Each case or 'palette' is a device and an enormous amount of data is being generated real-time. There's an obvious role here for a new service provider to aggregate that data and market it to others. For example, the logistics company, manufacturer or some third-party central company can now sell a new service to the pharmacy – the full track, trace and pedigree of the consignment. This is not just about streamlining. It's actually creating a new business.

In spite of all these opportunities, mobility is unlikely to generate a commercial Big Bang. Even cellular services, which are often held up as an example of explosive growth, have been around for nearly 30 years. Mobility is creeping up on the enterprise environment but we're not going to see the fundamental changes it can and will bring for at least two to three years from today.

> 'At the moment, knowledge is seen as a separate repository, disconnected from the business process. What you need to do is embed the knowledge within the business process. This model is going to drive a great deal of innovation and business change in the near future.'

This means that, frankly, the market is likely to be very confused in the short term. More corporations will become adopters or enterprise-wide users, but the proliferation of incremental solutions will lead to integration problems. As mentioned before, there's a great deal of consolidation required in this market which is currently highly fragmented.

The real drivers of change, we believe, will be the automotive, healthcare and logistics sectors. Automotive, because that industry is already technically far advanced – something many people don't realise and which is highly competitive. There are already initiatives that put vehicles at the centre of pervasive networks with integrated Device-to-Device, Enterprise-to-Device and Device-to-User solutions.

Healthcare is going to be significant, for the obvious reasons of scale and need, but there are significant added barriers for healthcare arising from its high political profile and the statutory constraints that go along with it. The logistics companies have a tremendous opportunity, because they touch on so many different companies and processes across the supply chain. This not only exposes them to a great deal of potential data, but also to a wide range of different client sectors.

'The real changes will come when companies begin to appreciate the new service-driven architecture that can structure their business. Today, a high percentage of the business activity is kept within the four walls of the company. Companies still need to grasp the fundamental redesign of their business model which would allow them to consider delegating this business process or that service to a marketplace.'

Looking ahead, the mobility market will develop in a similar way to the Internet, at least as far as adoption by corporations is concerned. We'll see new applications, more pilots, but it will be two to three years before the benefits really begin to matter. The real changes will come when companies begin to appreciate the new service-driven architecture that can structure their business. Today, a high percentage of the business activity is kept within the four walls of the company. Companies still need to grasp the fundamental redesign of their business model, which would allow them to consider delegating this business process or that service to a marketplace. They understand the marketplace outsourcing model, but only at a process level – call centres, product localisation and so forth – not at the service level that could change the way we do business entirely.

When that happens, be prepared for a true phase-shift in the way we carry on our business and personal life.

For more information on Capgemini see www.capgemini.com

One-stop solutions

Barbara Dalibard | Executive Vice President, Enterprise Communication Services, France Telecom

Through the complementary expertise of its subsidiaries, Orange, Wanadoo and Equant, the France Telecom group provides fixed/mobile services to its corporate clients, with an emphasis on simplicity and security. The key to its visionary approach is integration and partnership, and an understanding of how the convergence of consumer and corporate activity impacts on the value proposition they offer, as Executive Vice President Enterprise Communication Services, Barbara Dalibard, explains in this interview.

France Telecom is one of the world's leading telecommunications operators, with 125 million customers on the five continents, covering 220 countries and territories. Consolidated operating revenues for 2004 were €47.2 billion. It is the world leader in IP VPN services with 134,000 accesses worldwide, as well as the second-largest wireless operator and Internet access provider in Europe, providing businesses, consumers and other operators with a portfolio of solutions spanning local, long-distance and international telephony, wireless, Internet, multimedia, data, broadcast and cable TV services.

Q: How do you see mobility impacting on the business market today?

We must accept that today people routinely expect to connect at any time and in any place. 'The office' is becoming not so much a physical place as a virtual environment, a way of working, which workers expect to be able to tap into wherever they are. As a result, mobility is becoming fully integrated into corporate strategy. Today, we estimate that over 25 per cent of the active population in France is mobile. 56 per cent of companies have already invested in mobility projects and 37 per cent of CIOs see these as being a top priority for their company. One of the main concerns today for the IT department in any organisation, large or small, is how to manage mobility so that it works for both the company and the individual employees.

The business user's needs in a mobile environment are essentially simple. He or she needs first of all to be reachable. The office base must be able to count on instant and reliable contact with the operative in the field, and vice versa. Secondly, users want to be able to work wherever they are, with the same ease they have come to expect on their desktop. Thirdly, they want to be able to access the kind of vertical applications that are helping businesses achieve greater efficiency and profitability worldwide.

If their needs are obvious, it follows that solutions must also appear simple to use. The boundaries between business and personal mobile communications have become blurred, and business users expect the same convenience in working tools that they have come to expect from their personal mobiles. The issue now is not access itself, but ease of access. Users want to be able to press a single button, and become connected in one simple step.

An IT Director, seeing the problems from a company-wide perspective, is concerned to find a solution that can be easily managed centrally to support the worker in the field. I would stress the word solution, not solutions; we should take note of the singular. Like their mobile employees, IT Directors too seek simplicity. Many past difficulties for business users have been caused by a patchwork approach to solving problems. IT Directors understand the value of consistency. They do not want to chop and change between service providers; they are looking for long-term partners on whom they can rely, while still being able to take advantage of the best market innovations. Innovation is key to France Telecom's strategy. It is vital that we anticipate technological evolutions and new usage patterns, to satisfy our customers' needs, through innovative communications offers. These will shape their future business life.

As far as costs are concerned, not only are they seeking value for money but they also want to be able to predict with certainty the likely spend on mobile communications. They will be attracted by single billing systems and flat rate tariffs.

Customers now expect convergence and integration along every step of the process. There should be no incompatibilities between the application technologies and the hardware, all aligned with the customer's own specific business needs.

Q: Who is driving these changes and to what effect?

The interesting pattern emerging in recent years is that it is not so much corporate IT departments who are driving these changes as the end users themselves: mobility employees in the field. Among 'C-level' executives, for instance, there is a high level of take up of mobility solutions. They are concerned about the 'down-time' wasted during business trips if they cannot easily connect to the same working applications as they have on their desktop in the office. France Telecom's focus on innovation, expressed

through our 16 R&D centres around the world is a competitive asset. Each year, these centres deliver 200 innovations to enrich our offering.

We only have to look at the consumer market to realise what an explosion there has been in the use of hand-held devices. Because they are accustomed to personal mobile communications, today's employees understand the advantages of being able to work from wherever they are, and they demand to have a say in the kind of mobile solutions chosen by their companies. The boundaries are increasingly blurred between which devices are being designed for the personal user and what will appeal to the business customer. I would go further and suggest that the corporate and consumer markets are so rapidly converging that they can almost be regarded as a single entity.

Since the operator is no longer addressing two distinct markets with different needs, the challenge is to meet a single, converged demand for simplicity and consistency. But if one asks end users what they perceive to be the problems with current technologies, it is all too obvious that most operators are still thinking in the old ways.

Rather than technology unobtrusively serving their needs, end users often feel as slaves of the devices they carry. At France Telecom, we realised we must listen to what mobile workers were saying. They were telling us, for instance, that they had too many passwords to connect to their corporate intranet. They complained that it was difficult to get assistance when they had a connection problem, and that they needed, but did not receive, constant access to updated files and the ability to save changes in real time. The problems they had in these areas were a real drain on business efficiency. What they are looking for, and what will differentiate the successful operators in the future, is simplicity, as well as reliability and speed.

Q: How is France Telecom responding to these user needs?

Making life simple for the user is a complex process. Our aim is for mobile connectivity to seem as serenely effortless as a swan gliding on the water. But beneath the surface there will inevitably be a great deal of hard paddling, in order to make different technologies and applications integrate and 'talk' to each other. At France Telecom we have been able to rise to the challenge because of our integration with Orange, Wanadoo and Equant, whose expertise and experience enable us to offer a 'one-stop' end-to-end package for business users.

Q: How does that work?

I have already outlined what we at France Telecom see as the three main enterprise needs: the need to be reachable, the need to create a comfortable working environment on a user's laptop wherever he or she is, and the ability to access business-specific tools and applications.

We have examined how we could best achieve these aims. For instance if we look closer at the specific services that are needed to make the employee reachable, we identified that, in addition to voice contact, we must also provide access on the move to e-mail, address book and diary, making them updateable from either end. We also identified other services that it would be useful to consult from a mobile phone or a PDA, such as a phone directory. Today, GPRS technology is well adapted to this type of short 'burst' communication.

To enable people to work in any location with a laptop, as comfortably as if they were in the office, we recognised that they must be able to fully use messaging applications, and download and consult attachments as well as access corporate applications and files. Depending on the location, which could be home, hotspot, client site or hotel bedroom, the available network can be anything from ADSL to WiFi, GPRS, EDGE or PSTN. 3G technology and other new standards enrich this range of options.

'Our aim is for mobile connectivity to seem as serenely effortless as a swan gliding on the water. But beneath the surface there will inevitably be a great deal of hard paddling.'

The ability to access specific corporate applications and operational tools is helpful in both blue- and white-collar industries. Maintenance workers, for example, benefit from the ability to send repair reports or consult stock levels from a handheld device, whilst a delivery driver might update his route plan. Similarly, sales reps can process purchase orders, confirm an offer or consult a product catalogue.

Overall, we have concluded that the network must be easy to administer, dovetailing seamlessly with the existing applications the organisation has in place. There must be a hotline to solve employee communication and connection problems there and then, available around the clock wherever they may be. It should not matter whether the user is connecting via GPRS on the road or via WiFi in a café, hotel or from an airport lounge. Indeed it should not be necessary for the user to make a conscious selection of one network technology over another. The system itself should roam to find the optimum connection in that location, and transfer to it without the user ever being aware of what is happening.

Our aim has been to integrate networks so that it would be possible to offer seamless connectivity via a multi-access IP platform. In other words, we see a market for an end-to-end solution, encompassing everything from service level agreements to hardware integration and support. At France Telecom we have addressed this through for example Equant as a single point of contact

providing data/IP networks, voice, mobility and video services. This, after all, is what the busy IT Director wants: to deal with a single operator who can integrate the entire system, removing the burden from corporate customers and enabling them to focus on their own business, rather than wasting time solving complex communications issues. In turn, end-to-end solutions mean a simplified billing structure.

We have called our mobile solutions portfolio Business Everywhere. It addresses the connectivity needs of all business segments, from small enterprises through to multinationals. The philosophy behind it is one contract, one bill and a single customer experience. Connections are set up and managed through a single connection kit, regardless of the access technology in use or the country of location. It offers single password access, reliable service help desk assistance, automatic updates to phonebook and software, automatic detection of devices, and auto-launch of business applications. We provide adaptive levels of security with the ability to reflect the different usages of nomadic users. We offer flat-rate packages for intensive users, which are proving very popular. IT Directors like it because they are dealing with a single bill, predictable costs and the benefit of personalised services ranging from deployment to support.

'Operators will build the engine, but recognise that it must be the user who drives the car. Essentially users will be able to take for granted consistent and reliable connectivity at all levels and in all situations.'

We launched the service in June 2004, and by February 2005, we had signed up over 58,000 Business Everywhere users. Considering our original target had been 25,000 after the first six months, this represents a considerable success. For example, one of Europe's largest systems integrators with 8,000 employees signed up for our package to increase the efficiency of their staff as they travel around the continent. Their consultants can now re-create their usual work environment wherever they are. But it is not only the larger companies who seek mobility solutions. One of our customers for example is a small organisation specialising in event planning, which has equipped 30 of its employees with Business Everywhere. They can now work more easily from home or from event locations, saving travel time and increasing productivity.

There are few operators in the market place as yet who can contemplate offering such a service and, we believe, none in our unique position. France Telecom's own Research and Development knowledge of communications technology combines successfully with Orange's experience in the personal mobile market, and Equant's expertise in VPN solutions, enabling us to tailor a completely integrated package responding to every user's needs.

We are also fortunate at France Telecom that we have a strong international footprint. We are the only group present across the world in 220 countries and territories: we are able to provide in Nepal what we can provide in a small town in France. By the end of 2004 we had established over seven thousand 'hotspots' across the world. Our plan was to double that in the first quarter of 2005 and the numbers continue to grow. We decided that as hotspot providers we should aim to give the best coverage in airports and business class hotels. The concept is simple: using the Business Everywhere connection kit, the user interface will look the same regardless of the hotspot partner used. We still need to develop our service offerings abroad and the most likely way to do that – especially where fixed/mobile convergence is concerned – will be through partnerships.

Q: So what will the next 2–5 years bring?

The way I see it is that operators will build the engine, but recognise that it must be the user who drives the car. Essentially users will be able to take for granted consistent and reliable connectivity at all levels and in all situations. But they will be looking for more than that, and as service providers our real opportunity is to encourage the evolution of new mobile and hand-held devices. We will soon have PDA solutions in the Business Everywhere offer, securely providing push e-mail on any Orange signature device, working on any operating systems: an innovation that demonstrates the virtue of simplicity. But it is possible to go much further, offering full rich-text multimedia mail in conjunction with SMS/MMS, calendar updating, and video calling.

Most importantly, I predict that it will be the ability to offer integration and convergence, and anticipate future trends, that will differentiate the leading operators in the coming few years. What the business customer wants is something very similar to the personal user; single devices that offer a completely integrated mobile solution. A mobile phone that becomes a fixed phone when you return home; portable PCs that are a medium for voice contact as well as data access. We will see an increase in video services, and an explosion in location-based services. Hotspots will become more widespread and more sophisticated.

Q: Why is innovation so important?

We position ourselves at the forefront of innovation because we promote information and communications technologies to support progress and expansion. We keep ourselves alert to everything in that sphere which might serve to reduce the risk of negative effects such as social divide, invasion of privacy, etc. We have16 innovation sites (London, San Francisco, Boston, Tokyo, Varsow, Beijing, Seoul, New Delhi, as well as eight in France). Some 4,200 researchers are involved in the design and the development of 70 per cent of the products of the group. With 7,300 patents, France Telecom is in a leading position in terms of telecommunications research and development.

We strongly believe that innovation takes customers to new heights for evolving their business. For instance, we have implemented 'discovery workshops' in France, that gather customers once a week to discover and discuss new solutions which could meet their needs and wants. This can lead to a transformation of our customers' business models, increasing their competitive advantage.

In March 2005, in France, in partnership with Syntec and La Tribune newspaper, we created an award to promote innovative solutions developed by software houses and services companies. This was the first time, and I must say it was a true success!

Q: Security too is an increasing concern for businesses. How do you see operators responding to this challenge?

It is vital that mobile communications are impregnable. As more and more business traffic is carried on mobile networks, it is essential we keep ahead of the ingenuity of hackers so that we can safeguard data, while guaranteeing to keep costs under control and at a constant level. In particular we must look at ways to enhance authentication and billing platforms.

CIOs need to fight hackers on three different fronts. Firstly, they are concerned with authentication, the control and management of access rights to the corporate network. Secondly, they must be assured that the system has integrity, that all information shared and stored on the devices and desktops has not been and cannot be illicitly modified. Finally, they need to guarantee confidentiality, that information carried on insecure networks can be protected so that it is not in any way accessible to non-authorised users. This is clearly essential in establishing secure billing platforms.

Our solution has been to devise a way of offering a level of authentication adapted to the specific requirements of our business customers: security certificates, static or dynamic passwords. The integrity and confidentiality of data is enforced through tools such as encryption and antivirus software. We chose to integrate tunnelling mechanisms and encryption. We also aim to develop user support and services that are increasingly ergonomic, such as a USB dongle with a unique connection kit. Our WiFi/GRPS connections use IPSec technology, and the integration of WPA (WiFi Protected Access), the new WiFi security standard, is currently under review.

We have also found that users expect us to take responsibility for the entire range of possible problems that might arise from implementation and interoperability. Operators must be prepared to offer service level guarantees and security assurances to their customers.

Q: Considering the future you describe, what do you believe these developments will mean for the service provider industry?

Since the employee on the move now drives the profile of mobile access, rather than the IT department, we must recognise that the value proposition has changed. We should see the system as a whole, a process in which the desktop computer is as much a part of the network as the hand-held mobile device at the other end. How access is achieved at desktop level should also govern how access is achieved on the move.

Meanwhile, the rate of change in access technologies and innovative devices is breathtaking. These developments are driving the telecoms market. If business customers are using phones, laptops and PDAs, the operator must simultaneously be in the VPN, dial-up, 2.5/3G, video, voice and data businesses. Equally, the operator must play an active role in device development. If the device is cumbersome and unfriendly to operate, or if a simple and elegant front end fails to support all the functionality built into the back end, an operator will not be able to compete in the increasingly convergent marketplace. Our approach so far has been to take existing hardware and redevelop it in conjunction with third parties. The Orange signature devices are a good example of this, offering particularly strong office-style applications and desktop synching, such as 'push e-mail'.

'Users expect us to take responsibility for the entire range of possible problems that might arise from implementation and interoperability. Operators must be prepared to offer service level guarantees and security assurances to their customers.'

To safeguard their position in the market, operators must be ready to form new partnerships to guarantee true end-to-end compatibility. The forward-looking operator will need to build or acquire subsidiaries, or make alliances that enable it to bring expertise and experience to every part of the process. How ironic it is that telecommunications companies who not so long ago divested themselves of their Internet or mobile operations are now scurrying to buy them back. It seems to me that the communications industry forgot for a while what it means to be a network. Whether the way forward is partnerships or acquisitions, it is unquestionable that the industry must look to linked ventures to supply businesses with what they now demand.

Q: Finally, do you have any views on the impact of mobility on society?

It is all too easy to make grandiose predictions about the impact of mobility on business practices. I could argue that face-to-face business opportunities will increase as you spend more time on the road, that real estate costs will fall as less office space is required and that the office of the future will throw out the desks, bring in the sofas and transform itself into a private members' club where you and your colleagues catch up on business, tactics and news.

But how much practical value do such broad-based predictions really have, as we plan our business strategies for today? Inevitably technology is changing the way we work. But we must not allow these visions to distract us from a more universal truth: that in order to maintain our position in the marketplace, we must concentrate on the basic step-by-step process of providing the best possible access, security and service reliability. Whatever tomorrow holds we must make systems simple, consistent and indeed effortless to use; this is my vision for the future of France Telecom and our industry.

For more information on France Telecom see www.francetelecom.com

The future is in sight

Agnes Nardi | Managing Director, Hutchison Telecommunications (Hong Kong)

The way people communicate, their relationship with their phones, number portability and the immediacy of communication have together transformed the telecommunications industry. Mobility, uniquely, promises convergence between hitherto entirely unrelated industries. In this essay Agnes Nardi describes the unique characteristics of mobility which will shape future services: convergence between the Internet and mobile telephony, video features, and location-based intelligence.

Hutchison Telecom, together with its ultimate parent company Hutchison Whampoa Limited, is a leading global telecommunications and data services provider operating with a high growth strategy in 18 countries and territories. The Group is a dynamic and agile player with a strong track record as the first to market with an international 3G video mobile network under the brand '3'. The Group is a major owner and operator of the fibre optic broadband and fixed line networks in Hong Kong, serving as a telecoms gateway to China.

Ten years ago, you were probably sitting at your desk, waiting for the phone to ring. I make this guess with a fair degree of confidence, for the simple reason that that is what most of us were doing, much of the time. Our desk, our phone and our limited dial-up Internet connection, used principally for text-only email, together gave us our window onto our business world, our finger on its pulse.

This had all sorts of implications for business, most of which resulted in higher overheads and reduced activity. For example, people cannot wait all day for the phone to ring. They have to meet, travel, and eat. Since they were out of contact during that time, they needed people to answer the phone on their behalf.

Meeting schedules were less flexible, too. Once two people left their desks to meet up – either around the corner or on another continent – they could no longer communicate with each other directly while in transit, but had to rely on messages sent via a third party. We are all familiar with the problems that this could entail: the frustrations of relying on public telephone boxes often out of order; the incorrectly transcribed address; the last-minute delay that we could not tell our colleague about; the message we left about a change of plan, but which was never delivered.

Now consider the situation today. You no longer need someone to field calls in your absence, because your contacts – perhaps just your privileged contacts, but that is your choice – can call you direct, with almost no regard for your location or time zone. If you do not answer, your mobile answering service takes a message. Even better, the message can contain photographic or video material that you can review, and respond to, immediately.

Meetings that once had to be carefully scheduled to reduce wasted time can now be more ad hoc. Your contact is in your vicinity en route to an airport: using your mobile phones, you can schedule to meet on the fly, travel to within half a mile of each other, and then locate each other with a second call. You can text numbers, addresses, arrival times. And if you cannot make the appointment, you can advise the other party immediately, saving them greater inconvenience.

2.3

> 'We are going to see the power of mobile telephony significantly enhanced by the power of the Internet. The convergence of these two technologies is going to force a re-engineering of business processes and systems.'

Once you arrive, you may be only yards away from your contact but unable to find them. With a 3G handset, you can even relay live video of your surroundings, providing them with the visual cues they need to locate you.

We take all this, today, for granted. Whatever network you subscribe to, the result is that our desk is a less familiar place than it used to be. I do not know about you, but personally I used to be at my most productive if I stayed in my office with my fixed line phone and my PC. Now I need just my mobile, my Blackberry and, while I'm on the move, I can now spend more time discussing issues with my colleagues, giving them some of my input, providing them with directions and making decisions that can carry my business forward. Actually, a research shows that the use of secured mobile e-mail applications has a positive impact on both employee productivity and enterprise costs. A study conducted in 2004 shows that the average user converts 47 minutes of downtime into productive time per day, and remote team members can now work more efficiently together.

Mobile communications have demonstrably changed the way people conduct their business. For some, it has revolutionised it. Real-estate agents, insurance agents, people who are constantly on the road, these people have already seen their working lives transformed by analogue and 2G phones. They can be in constant touch, be contacted by existing clients and address new ones.

But that's just where we are now. What can we look forward to, once we move to 3G and beyond?

Enabling technologies can generate a wide spectrum of innovative services. Most fall into at least one of tomorrow's most appealing service areas: convergence, video and location-based services.

First, we are going to see the power of mobile telephony significantly enhanced by the power of the Internet. The convergence of these two technologies is going to force a re-engineering of business processes and systems. The existing popularity of applications such as Blackberry – email being one of the most important tools for business users – together with the prospect of fast, secure mobile email and attachments, seamless roaming, global coverage, integrated fax and messaging, all combine to demonstrate enormous potential.

'Video-based applications are already shaping up to be a killer application area for 3G. There are some vertical markets which are crying out for solutions in this area: engineering firms, architects and construction companies, to name but three.'

In Hong Kong, for example, we've introduced systems for Hong Kong Post to improve operational productivity and customer service, and strengthened the management of outdoor postal activities.

With the implementation of the new courier delivery management system (CDMS), the whole pickup to delivery process is streamlined. Pick up requests will now be directly transmitted through the GPRS network to the postmen's mobile PDAs. The postman can collect the items at once and use the PDA built-in barcode scanner to input customer and item information. The information is automatically transmitted to the Air Mail Centre via the GPRS network and the item can be delivered to the destination quicker than before. Urgent customer calls can now be attended to more efficiently and effectively, as the PDA will notify field postmen working in the vicinity of any real-time orders. The new system streamlines the workflow, allocates the resources more effectively, enhances the efficiency and productivity of the processes, and enables Hong Kong Post to be more responsive to customers.

Although it's not always easy to quantify the benefits of such initiatives, common sense dictates that, for example, a fleet operator who can pinpoint the exact location of each vehicle is going to find it easier to identify the one nearest to the next job than an operator who has to make, at best, an educated guess. And if a postman can update the system while on his round, common sense again dictates that the system is more likely to be up to date than one which must await his – possibly delayed – return to base. And it also means that the postman can stay out on the road for longer without jeopardising the efficiency of the operation as a whole.

Second, video-based applications are already shaping up to be a killer application area for 3G. There are some vertical markets which are crying out for solutions in this area: engineering firms, architects and construction companies to name but three. Add to this the fact that our 3G phones can interconnect with voice-over-IP and you have a wealth of possibilities, from consumers being able to directly address remote web-cams for home security to the less obvious but perhaps even more valuable opportunities for people requiring special assistance.

On the business front, people tend to think of video conferencing when they consider the opportunities of 3G. Of course, there are times, particularly in negotiation, when face-to-face contact is essential to avoid misunderstanding, so video conferencing on demand, as opposed to having to pre-book it through a dedicated service, is set to become a vital and significant technology.

But face-to-face video is just one aspect of what I would call 'the power of seeing'. To give just a few examples, consider an engineer on a site visit. A quick video of a faulty unit can help the supervisor – back in the office – determine the problem and advise the engineer on how to proceed.

There are many times at work when a remote presence simply won't do – what you really want to do is to be there. I can pore over sales sheets but there's no substitute for walking the shop floor and seeing the customer traffic in each department, by each shelf, for myself. In the old days this required some very expensive equipment in each store, but now I can just call the shop manager and say, 'Show me what's happening…'.

Seeing something for yourself puts you in control. For example, traffic is a problem in all major cities these days. In Hong Kong, we've started a video streaming service which provides live traffic conditions from various high traffic areas. In areas around Kwai Chung Container Port, people working in the transportation industry can use their phones to assess traffic conditions around the terminals for themselves, rather than rely on a third-party verbal summary. This gives them greater flexibility in managing their time and helps them to deliver containers to the terminals with minimal delay, interpreting the traffic patterns according to their own experience.

To give you a personal example, my advertising agency is a lot more efficient these days when it comes to servicing our account. I used to give them an idea, they'd work on it, we'd meet, review, bounce it back and forth – this process could take days. Nowadays they just give me a video call, show me the material and ask me what I think.

Examples like these help explain why, although the most conspicuous feature about our own '3'-branded video offerings is their consumer appeal, we're finding that corporations are at the forefront of 3G adoption. And there are the other factors as well – faster Internet connection, easier access to news and financial information, as well as email services. With the latest UMTS wireless data card and VPN Connect Service, '3' customers get up to 384 kbps high-speed wireless Internet access. If they then log into a VPN (Virtual Private Network), they can securely access their corporate Intranet and other private corporate systems.

Thirdly, location-based services are becoming more and more important. Although simple in theory, in practice location-based services are difficult to implement and bring with them a host of security and privacy issues. We're tackling these successfully, however; witness our new 'Follow Me Follow You' application. This helps you track down your friends, relatives and colleagues by simply keying in their mobile number. With their permission, you can then receive an immediate update on their position.

Whether it's anxious parents or gregarious Hong Kong teenagers, we're already seeing rapidly increased demand for this category of service. What we did not anticipate, however, was that a consumer application like this could trigger demand from corporates. Suddenly, we had companies calling us, telling us they have seen 'Follow Me Follow You' and want it for their business in order to track their workforce and, by knowing their exact location, manage their time more efficiently.

There are several key areas that will shape 3G technologies and services in the coming two to three years, prime examples being network speed, security and billing/payment solutions.

Network speed is important because of the continued convergence of Internet and mobile technology. Most internet users and providers are becoming increasingly accustomed to – and are therefore provisioning for – access speeds in excess of 1Mbps, with some domestic services now offering asymmetric services to the consumer with download speeds as high as 10Mbps. As Internet content and services develop to support these speeds, mobile technologies will need to keep up.

You may have heard terms such as HSDPA (High Speed Downlink Packet Access) and MIMO (Multiple-Input Multiple-Output) bandied about. Currently 3G transmits at a peak rate of 384 Kbps but with HSDPA and MIMO it is expected to increase to 20Mbps or higher.

This in turn will create further issues that need to be addressed. Local storage for mobile devices needs to be developed, although the high speed of 3G services could spur the introduction of server-based storage solutions. For example, we have a DV Club Sharing Channel. The customer dials a shortcode (in Hong Kong it's #506666) on their video handset and they can then instantly capture video and stream it to the back-end. This means there is, in practice, no limit to recording time and no local storage issue. Users can then share their videos with friends or even publish them for viewing by all users.

'What we did not anticipate, however, was that a consumer application like this could trigger demand from corporates. Suddenly, we had companies calling us, telling us they have seen "Follow Me Follow You" and want it for their business in order to track their workforce and, by knowing their exact location, manage their time more efficiently.'

2.3

Handset power and network speeds will drive the development of new applications which in themselves are more far-reaching, so security is likely to become a major focus. Whether you're purchasing online, exercising your statutory rights as an e-citizen or trading stocks by phone, you need to be protected against identity theft and other unauthorised access to your account. Application providers need security too, to protect intellectual property and comply with data protection regulation. Secure networks will be an essential part of the 3G roadmap.

Billing and payment systems need to be further developed as well. M-commerce has tremendous potential, but current systems for monetising the user are cumbersome and do not efficiently support micro payments. Solving this last problem could open up a host of new applications: there are many infuriating aspects of our lives – finding change for a parking meter, for example – that could be better addressed by a mobile micro-payment system.

People tend to forget that the mobile industry is still a mere stripling in the school of telecommunications. The first voice transmission took place in 1875, but the mobile cellular industry did not really find its feet until 100 years later, in the early 1980s. It has, however, experienced phenomenal growth and has already – at the most conservative and almost certainly heavily understated estimate – more than 1.2 billion users worldwide. In some territories, mobile phone usage has surpassed that of fixed lines, Hong Kong being just one example. The way people communicate, their (very personal) relationship with their phones, number portability, the immediacy of communication have together transformed the telecommunications industry. Going forward, there will be further evolution leading to convergence between the fixed line, the Internet and mobile phones.

'Photography, video, digital audio and PDAs are all converging on the mobile device. This development will have a major effect on the world economy. The mobile phone is becoming a distribution channel – but unlike previous distribution models, this one is personal, anytime, anywhere.'

Mobility, uniquely, also promises convergence between hitherto entirely unrelated industries. Photography, video, digital audio and PDAs are all converging on the mobile device. This development will have a major effect on the world economy. The mobile phone is becoming a distribution channel – but unlike previous distribution models, this one is personal, anytime, anywhere.

In conclusion, it's clear that mobility and its future is a true catalyst for change. I'd like to add that, for companies like Hutchison Telecom, while the commercial case is clear, it is also a privilege to be given the opportunity to pioneer a technology that will transform not only our businesses, but also our culture and lifestyle.

For more information on Hutchison Telecom see www.three.com.hk

Emergence of the digital office

Shreekant (Ticky) Thakkar | Director of Mobile Technology,
Mobile Platforms Group, Intel

Ticky Thakkar explores how the vision of a truly digital and mobile office is coming to life through the development of next generation devices which include revolutionary functionalities, such as low power multi core processors (eg two or more processing cores inside a single chip), lower power integrated graphics and media chipset, array microphones, advanced voice and video software, and fingerprint sensors. He also warns of the challenges which will need to be overcome. These include the ability for devices to communicate with each other, secure and straightforward connectivity, transparent IT management capabilities, as well as consistent user authentication and billing services.

Intel, the world's largest maker of chips, is also a leading manufacturer of computer, networking and communications products. Founded in 1968 to build semiconductor memory products, Intel introduced the world's first multiprocessor in 1971. Today, Intel supplies the computing and communications industries with chips, boards, systems and software building blocks. In 2004, Intel recorded revenues of $34.2 billion and spent $4.8 billion on R&D.

Mobility is the future. And making collaboration work over wireless networks is the next big step. At Intel, where my job is to drive forward our mobility vision, we are working hard both to develop greater mobility within our own business and within the businesses of our customers to understand how best to embrace this opportunity.

Mobility is all about making collaboration work. It enables a workforce to work wherever and whenever it chooses to, taking the fullest advantage of the concept of the Digital Office – a modular, working environment that is truly adaptable, totally mobile. So, in effect, mobility becomes a lifestyle. For proof of this, consider the new Intel concept platform based on next-generation Intel® Centrino™ mobile technology: a next-generation Digital Office wireless notebook with embedded array microphone and video camera. This notebook makes the office environment virtual, giving users the flexibility to collaborate and work from wherever they are. The fingerprint sensor makes it simple to log-in. This is mobility's future in enterprise.

To understand our vision in more detail, let's consider what we are doing within our own business. Today, around 70 per cent of Intel employees globally use notebooks instead of desktops. This figure is one of the highest you will currently find within the industry. Our rationale is all about creating greater flexibility in terms of where and when people can work. All of these notebooks are connected. And all of our sites are wireless now, including places like India or China. You arrive in an Intel office, you open your notebook and you can immediately connect and be productive.

Most of our people now take notebooks to meetings to record their notes; they use them for sharing information and for presentations and, again, they use them once they have gone back to their desks. Recent research we conducted explored how many meetings notebook users would like to connect in and how often they were successful in connecting. Wireless users connected successfully in 92 per cent of their meetings compared to 79 per cent of wired users. This supported comments from 20 per cent of our users that ability to connect in conference rooms when there was not enough wired network ports was one of wireless's key benefits.

> 'We want devices such as notebooks, desktops, digital home devices and handhelds such as cell phones and PDAs to communicate seamlessly between each other: in effect to behave as "one logical device".'

Wirelessly connected notebooks have become pervasive within the organisation – there's no differentiation between work functions: they are used everywhere. The majority of our users recharge their notebooks between meetings when they are at their desk.

Many of us used to carry Blackberries before we rolled out wirelessly connected notebooks, and a significant number still use both. But the need for Blackberries has gone down significantly. A Blackberry is your 'always-on' device, but your notebook is your mobile, wireless workstation. Mobility within the home and at work are the two predominant uses for notebooks. As a growing number of places outside the office now have broadband access, and as employees on the move increasingly access networks wirelessly – at airports, in hotels, and so on – usage is becoming ubiquitous.

The mobile phone, of course, is another important working tool. It's a device which is easy to use, it's always on and all my key contact details are readily available. I don't have to think about security. I don't have to think about connectivity. I simply do what I want to do: dial a number.

For the benefits of mobile computing to become reality, however, three key elements must fall into place: transparent yet effective secure and manageable systems, ease of connectivity, and the integrated/consistent sign-on and billing across multiple networks on a global basis. With these in place, everyone can connect. And once everyone can connect, then the vision of true collaboration can come to life in the Digital Office.

We need to address security concerns before true benefits of mobility are to become a reality. Notebook-like devices aren't as easy to use as mobile phones – at least not yet. True, they've become much easier with the introduction of Intel Centrino® mobile technology and its continuing development, but there is yet some way to go. We still deploy secure virtual private networks, require multiple set-up profiles and so on. So within enterprises today it's fairly easy to get a connection and be connected, but once you leave it becomes more cumbersome. Greater security must be effective yet transparent for the user. It's all fine and well putting ten dead bolts on your front door to keep out unwelcome intruders, but why should you have to spend 30 minutes unlocking them all to get in? Why not rather have a more effective yet simple, single lock?

Intel is also driving capabilities in their silicon so that next generation Digital Office notebook and desktop systems can be transparently managed in order to update user systems with new patches without their intervention. Additionally, these systems will have the capability to disable connection from corporate networks when a known pattern of attack is detected by communication controllers. The systems can notify the IT staff of the issue, who will take appropriate action to fix the problem via an out of band access on the controller.

The second key element required to take full advantage of mobility is straightforward connectivity. Specifically, ease of connectivity in public places must improve. Connectivity at the airport, in hotels and so on, is still not as easy as it should be. Connectivity achieved as simply as pressing a single button – one-button connectivity – is essential for both easy connection to services and to other devices. We want devices such as notebooks, desktops, digital home devices and handhelds such as cell phones and PDAs to communicate seamlessly between each other: in effect to behave as 'one logical device'.

And here's an example to illustrate just how important this will be to the end user. I was in the lounge at Hong Kong airport recently and had connected through the Singapore Airlines service, when this person kept coming near me. Finally he got the courage to ask: 'Are you connected?' I said: 'Of course'. He'd been trying to connect his notebook but he was having trouble getting it to work.

It turned out that he had a network bridge in his wireless LAN controller and it was connected behind the bridge. In that situation you have to go and tell the bridge to allow the connection, and his machine was hard-wired to a gateway and fixed IP so you couldn't dynamically get an IP address. I fixed that, but there was still a bridge behind it so I had to go and resolve that too. Those kinds of situations are highly irritating and it frustrates the heck out of people trying to make wireless work on the move. Why should you need to be a technology expert to enjoy the full benefits of wireless technologies? It should – and must be – straightforward for all.

Ease of connectivity is a big deal. And once you've got ease of connectivity, the third matter is how to sign on to and pay for the service. It's very frustrating to have to pay every single time you connect when you're out and about, since everyone has different ways of connecting up. You pay T-Mobile or Orange in some places, a Chinese, Japanese or Korean network provider somewhere else. For people like me who can be on three continents or three places in just one week it's hard. You don't understand where to put in your details, and sometimes the pop-up screen doesn't even have recognisable English-language characters. So making it easier to connect and bill globally is paramount.

2.4

'Our vision may be focused on 2010, but we're already enabling a number of new mobile capabilities to go into systems that will come out in the latter part of 2005.'

Over and beyond access, collaborative working via wireless networks is the next big challenge. Our vision may be focused on 2010, but we're already enabling a number of new mobile capabilities to go into systems that will come out in the latter part of 2005. For example, array microphones to allow the generation of high-definition audio input through the notebook. Such built-in array microphone technology should provide sound quality equivalent to that of a $200 microphone for just a couple of bucks, because the sound processing is done through the notebook's processor. Starting in 2006 we'll see even more predominant use of those functions as well as softphone applications (Voice over IP software). I think that a lot of people are starting to believe in this vision now that they will be able to use these features within the next 12 to 18 months. Cameras are a good example. The next thing will be video conferencing capability. The new H.264 video coding standard should provide fantastic video quality. Additionally we will optimise our wireless controller to prioritise delivery of voice packets to offer users a better experience.

All this, we believe, is going to become one of the predominant drivers for VoIP and multimedia communication using the notebook. We view VoIP is one

of the most important future wireless applications. At Intel, we're using it to a certain extent today and we call this our 'virtual office': I've got everything I need now, I don't have any papers at my desk, everything I have is in my notebook. The one thing I don't have is a physical desk phone, since even that can become mobile. I'm currently using a softphone application on my notebook, which is connected to a wireless headset. If you call my desk it will ring here, wherever I am in the world, through an Internet connection, so I use that as a way to connect back to work. Cellular connectivity between our buildings is not great. But with VoIP and WiFi it's great and economical, too.

With the advent of all these features today prices are dropping significantly. Mobile technology's time has truly come.

Now we're at that point where you're just using the notebook as a conduit – a form with voice and video. But think just one step further and new possibilities arise. With a Customer Relationship Management (CRM) application from Seybold or PeopleSoft, when a client call comes through the machine, the application will pick it up as well as show me there's a call coming in and who that caller is. It can then link me to a database dedicated to that customer, bring up all of the relationships that I have with him in terms of mail messages, the last time we talked, and so on. I no longer need to spend ten minutes searching for the stuff – instead, this data is staring me right in the face. So you've taken voice and video and combined them so they become attributes of the application.

> 'Towards the end of the decade I expect to have roaming broadband connectivity, which will be as pervasive as cellular.'

You can't do all this on a VoIP handset, of course: your data doesn't live in that device. While cost reduction and providing handsets with Internet connection may be a growing priority, the fact remains that a telephone connection is still primitive in terms of the functionality it delivers. So we truly believe that notebook-like devices will become the foundation for the digital office and will bridge our collaboration needs with voice and video. Then, application integration will be a big part of everyday life. Already, you could be anywhere on the planet now and be able to get into your data, and have your customers communicate with you, and you can work flexibly.

The role of the cell phone will evolve. One of our current priorities is to make different devices work well together. Today, to make the Blackberry or cell phone and notebook talk together means I must plug in the USB cable and synchronise all sorts of things. They're still two independent devices. They're not related and don't cooperate well to accomplish a task simply. And this is where one-button connectivity – the ability to connect two devices at the

push of a single button – particularly comes into its own. One of the things I want is to have a single button on my cell phone or Blackberry so I don't need to plug in anything but can just hit that single button to send something to my Intel Centrino mobile technology based notebook. Once it's connected it's very transparent: I can just move files to it if I want to, I can upload media or download photos that I've taken.

With 3G cell phones, now I have a cellular modem with sufficient bandwidth to actually use it with my Intel Centrino mobile technology-based notebook for data connectivity when out of reach of a WiFi hotspot. With a device like Blackberry, soon we'll be able to download attachments to the mail with 3G class services. If I have to plug in wires and synchronise and download, it's too complex. I want to be able to simply click a button and download attachments. I can then edit and upload them to send once I get off the plane, for example.

The cell phone can also fulfil a highly complementary role as a back-up device. Today, everybody carries the little USB drive and plugs it in to transfer data. I want to be able to transfer small backed-up amounts of data into my phone. I can then use this data as back-up safety or for quick transfers to other devices.

2.4

At some point these devices will have roaming wireless broadband capabilities such as WiMAX, so towards the end of the decade I expect to have roaming broadband connectivity which will be as pervasive as cellular. I just don't see 3G cellular service currently as cost-competitive nor becoming truly complementary in what I use today. It's a technology designed for voice primarily. Plus it is very expensive at current rates of about $80 per month.

Many new mobile phones are just as capable as a Blackberry, so I think that over time these two devices will merge. Some people are already talking about the micro PC as being well-positioned to bridge the gap between the phone and notebooks. My take is that having enough computing power for both productivity work and entertainment, being able to plug into a connector, to get to a bigger screen and to utilise Bluetooth[1], Ultrawideband or WiFi connectivity would be valuable features to have. The device should be portable – pocket-sized. It will provide a full notebook experience when docked, and then transform to a PDA-like experience when undocked.

1. Other brands and names are the property of their respective owners.

We are convinced that in the future all business people will have mobile machines and that these won't look like today's notebooks. These mobile devices will interact with infrastructure PC's which will be embedded in fabrics of offices, conference rooms, trains, planes, cars and homes. These infrastructure PCs will resemble TVs and have LCD screens inside tables, walls, backs of seats with new features built in: array microphones, digital cameras, softphone applications. The screen is a computer, and the computer is hidden behind the screen. These will allow you to work

collaboratively wherever and whenever you choose. And they will be an entertainment platform, too. They could be sitting on your desk at work or in your home office, your kitchen or even your son's room. They will be designed for multiple functions and ease of use. The point is that while the physical form of the device may vary according to the user and his or her particular requirements, the wireless technology and the general principle behind it remain the same.

Work styles will change a lot in coming years as a result of all this. Other research that we have conducted shows how work styles are already changing as a result of mobility. Wireless working results in smarter working rather than longer working hours: respondents told us they are more likely to 'time-slice', or squeeze work into smaller chunks of formerly unused time, reducing the impact on personal time while achieving the same business outcome. Some told us they can more effectively manage time spent commuting to and from work using wireless hotspots. Wireless mobility at home, meanwhile, means workers can stay in touch without having to withdraw from family or other activities. Overall there is a belief that mobility enables workers to achieve a better work/life balance: the added flexibility and convenience of wireless working.

'Wireless working results in smarter working rather than longer working hours: respondents told us they are more likely to "time-slice", or squeeze work into smaller chunks of formerly unused time, reducing the impact on personal time while achieving the same business outcome.'

Today, collaboration is the foundation for the 21st-century knowledge worker. Being able to collaborate around the world is powerful. Try talking to Japan or China, or making an international conference call from your mobile PC and you may not always be able to understand the other people involved. Put a camera there, however, and at least you're able to read their body language: you know what their mood is. So I think this will come. But the true potential of mobility isn't just about enabling different ways of working. Mobility's influence is increasingly permeating our daily lives – both work and recreational. Mobility is becoming, in effect, a lifestyle.

For more information on Intel see www.intel.com

The Florence 12" On-the-Go concept family

2.4

The Florence 15" Digital Office concept family

Driving and managing growth

Len Lauer | President and Chief Operating Officer, Sprint Corporation

Sprint anticipates significant growth in business mobility usage, driven by the resulting gains in employee productivity and business differentiation. Len Lauer explores how the critical factor affecting this growth will be the ability of organisations to move to a more standardised, secure and integrated approach to managing their mobility needs.

Sprint has a long history of developing, engineering and deploying state-of-the-art network technologies and currently serves over 26 million mobile phone subscribers, including many business customers, on its US wireless network. Sprint offers an extensive range of innovative communication products and solutions, including global IP, wireless, local and multi-product bundles. A Fortune 100 company with more than $27 billion in annual revenues in 2004, Sprint is merging with Nextel to create America's premier communications company.

With employees spending increasing amounts of time away from the office, whether working from home or travelling for business and on the road, cost-effective mobility is becoming critical to increasing productivity and providing better customer service. Near-instant access to information during the sales cycle can now make the difference between closing and losing a deal; similarly, deploying wireless technologies in the distribution sector can help shave percentage points off operating costs in environments where margin is everything.

While these new technologies hold out the promise of delivering tangible business benefits, they also bring a number of challenges. Much of the mobile technology adoption today is driven on an ad hoc basis by a CIO's internal customer – the business user – rather than being managed by the IT function, which creates complexity and missed efficiencies for the enterprise. At the same time, security concerns, cost containment issues and the challenges of managing a diverse set of mobile devices and technologies are at the forefront of CIOs' minds.

The benefits of enterprise mobility have already been proven by early adopters in several industries, and as a result, CIOs are experiencing increasing demands to provide the appropriate infrastructure within their own organisations. However, realising these benefits requires a combination of tighter operational control, strategic planning and new ways of looking at relationships with service providers. Businesses must evaluate how mobility will impact the four core areas of their business: reaching new customers, increasing current customer loyalty, driving revenues with new products and services, and ensuring the correct cost structure is in place to be successful. Once understood, CIOs must begin the process of sifting through the numerous options to find the service provider best capable of supporting their enterprise objectives.

A complex business case?

Most enterprises today still see wireless as a nice-to-have option rather than as a core tool for increasing productivity or improving customer service. This attitude seems to be changing as demands for mobility increase across the enterprise. An important realisation to the industry has been that the killer mobile application did not have to be created – it already exists. Companies have been investing in back office systems and tools for decades and access to those data sources represents today's killer mobile applications. Ensuring your workforce can access the critical data in a rapid fashion whenever they need it is the true value of mobility. Many companies are realising that they can now leverage their Enterprise Resource Planning, Sales Force Automation, Customer Relationship Management and other critical applications that are rendered useless as soon as a mobile worker steps out of the office. As such, divisional heads and other executives are increasingly looking to push more on-time data out to their workers, such as field sales forces, engineers, claims adjusters, health care workers, or truck drivers.

Sprint sees mobility growing alongside rather than replacing existing wireline connectivity options, with the key drivers being enhanced employee productivity as well as the ability to provide improved customer service. Employees increasingly operate in three different domains. No longer tied to the desktop, they can remain connected in the workplace, at home, or in the field. Even within the workplace, they can be at their desks, out on the factory floor or mobile within the office. Wireless technology is helping to ensure these mobile workers remain both connected and productive. In addition to the obvious gains in employee productivity, mobility can provide a significant enhancement to how a company interacts with and provides services to their end customers.

The efficiencies gained through the use of mobility are also being applied to the movement of goods. Advanced distribution centres now use WiFi with

RFID (Radio Frequency Identification), which tracks goods as they arrive and allows employees to pinpoint their product whereabouts. If the distribution centre sub-contracts an overnight transportation company to pick up and deliver goods to the customer, RFID continues to track product location so that the supplier knows when the goods will reach the customer. In this way the benefits of wireless roll down the supply chain.

Tracking vehicles and other assets brings clear benefits to the transportation industry, enabling, for example, the ability to track and perform preventive vehicle maintenance. Mobile data services mean that you can also push critical, real-time customer information to drivers, giving them the client pickup point 'just in time' throughout the day. These services can be allied to location-based services that help the driver get to that client. More efficient scheduling can be achieved with the coordination of location-based services and real-time appointment availability updates. Further, location-based vehicle technology enables rental companies to track asset usage, allowing them to ascertain whether usage stays within the terms of the customer's contract.

Professional services industries have traditionally been early adopters of mobile technology. Their employees are on the road often 90 per cent of the time; they all use mobile devices, from mobile phones and PDAs to laptops with air card access; and they tend to be very information intensive. In particular, the finance and insurance industries lead the way because of their needs for mobile data while in the field.

Within the insurance industry, there are many handoffs in the claims or underwriting cycles. Claims adjusters utilise the ability to access claim information, and append digital photos at the scene of an accident or disaster, upload to a backend system so that it can move to the next phase of the cycle. Mobile applications and data allow an adjuster to collect and process customer data in the field, reducing process cycle times while providing a significantly improved customer experience.

> 'An important realisation to the industry has been that the killer mobile application did not have to be created – it already exists.'

The healthcare industry is embracing mobility for patient care, access to patient records and access to specialised but remotely located physicians. Additionally, many care providers are integrating mobility within their facilities for faster and secure distribution of patient records as well as providing real time data to healthcare professionals in order to triage more effectively. From the customer service perspective, healthcare providers are utilising mobility to improve the patient experience while actively reducing the chances for medical errors to occur due to misread or misplaced patient information.

Despite apparent advantages, it is not always easy to gain company-wide alignment and sponsorship for wireless initiatives as many of the benefits are intangible, making it difficult to justify the efficiencies of such an undertaking. In addition, juggling priorities of technology versus business process can create cloudy directives and ambiguous initiatives without defined measures of success or quantifiable results. In some cases, it is the end users who are demanding better and more immediate access to information; in these scenarios, the answer then is obviously a mobility strategy. The 'how' to implement is not always so clear. Realising these roadblocks, Sprint has developed techniques that allow companies to identify, quantify and measure the costs and benefits of implementing a mobile strategy.

Sprint can help enterprise customers implement time and productivity studies to determine the benefit of marrying existing business processes with mobile technologies. Often, these cases involve both tangible benefits – in the case of adding one more sales call per day using sales force mobility tools – as well as intangible benefits, including improved customer care. In the instance of one insurance carrier, employees reported that mobilising claims applications allowed them to perform 25 per cent more client visits in the same amount of time spent on the job.[1]

1. Validated statistics by 3rd party analyst firm, published report by Celent.

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Mobility needs to be viewed not just in terms of cutting costs or delivering productivity gains today, but also as a way of increasing your options when planning for growth. Mobility allows an organisation to differentiate itself in a competitive environment by providing new capabilities. Growth is an imperative for enterprises today, and mobility can help drive that growth.

Meeting today's challenges

Up until now, the growth of mobility technology within the enterprise has been largely user-driven. In practice, employees choose their own devices and charge their bills back to the company as a business expense. This wrests budgetary control away from the CIO – and from an administrative (and cultural) point of view, it's costly to seize back. Yet without that control, it is hard to implement mobile technology standards as well as the extent to which existing IT policies are enforced to protect sensitive corporate data. As a result, many CIOs have been unable to advocate enterprise-wide mobility.

CIOs will increasingly want to support just one or two devices and operating systems and, in many cases, will prefer to deal with a single provider. The reason they have not done so until recently rests primarily with uncertainty about continuity of coverage, especially in the US. This situation has changed as service providers have greatly increased the coverage and quality of their networks. Moving toward a single provider can generate significant economies of scale while also giving enterprises greater control over standards and security. The adoption by CIOs of enterprise-wide standards for mobile technology, like those adopted for desktops and laptops, will help

drive enterprise cost savings and enhanced security policies. Savvy CIOs already realise that new policies and procedures do not need to be created for mobility, but rather investments should be made to ensure current policies can be extended to the mobile medium of transport.

An important challenge in the wireless environment is security in all its forms, from securing information in transit over public and private networks, to restricting access to mobile devices and authenticating users as they access corporate information.

> 'Customers should be looking for two key elements in a service provider. The first is the right infrastructure and services to enable mobile applications, and the second is service provider relationships with key application partners.'

Service providers have an important role to play in helping CIOs meet these challenges. Sprint's Managed Mobility Services, for example, assist with not only addressing the mobile security issue, but allow the IT department to push and manage specific certified applications to the handset, all over the air. The security services range from protecting data using encryption to neutralising end-user devices when they are mislaid. For example, after an employee reports a device lost, the enterprise can change the password. If the device is not found, Sprint can disable it over the air, resetting it so that all enterprise data in that device is eliminated.

Much of the management associated with security can now be done remotely and completely over the air. Keeping applications such as anti-virus libraries and data encryption packages up to date is critical to protecting data. In addition, now simple security policies such as password configuration can be enforced on all mobile devices. The tools provided by Sprint Managed Mobility Services give the IT department the necessary peace of mind to confidently and systematically deploy mobile devices and applications.

With Sprint Managed Mobility Services, Sprint helps to address other challenges associated with the management of every individual mobile device and its associated operating system, including procurement, licensing and logistics. These issues are more than merely administrative: when an employee leaves, for example, Sprint can ensure that the company retrieves the mobile phone and can shut off access, thereby removing the potential for misuse.

Customers should be looking for two key elements in a service provider. The first is the right infrastructure and services to enable mobile applications, and the second is service provider relationships with key application partners.

Infrastructure requirements include the ability for the mobile network operator to identify location, presence, follow-me services, alarming of devices, as well as efficient transport for voice and data. In addition, published APIs will allow customers' applications to be integrated into that network.

Service provider relationships with application providers are critical, as they can result in savings of six to twelve months of time-to-market when migrating authorised applications from a desktop to a mobile environment. Sprint has partnered with IBM and other key application providers to develop an integrated business mobility framework for the enterprise.

Future mobility trends

The key trend touching the entire industry is the move to unify services, devices and networks. Our customers will be truly mobile – without giving a thought to what network they are on, they will be able to seamlessly move between networks and devices, and have access to any authorised application using any device from any location.

We see this trend emerging today as mobile users are given the option to connect using WiFi at the airport or coffee shop, their PCS card from a car or customer site, or a broadband or dial-up connection from home, office or hotel room – all simply, securely, for a single price.

The distinction between devices is blurring as mobile handsets grow in power, becoming more like computers, and WiFi mobile radios are included in the handset. Employees will no longer require both a desktop phone and a mobile phone, and multiple contact numbers, but instead will use one single mobile device that sits in a docking station while at the desk. With seamless hand-over between different wireless technologies and only one bill, CIOs can be agnostic about access technologies.

The potential for unified services becomes more powerful as we migrate from circuit-switched to packet-based (IP) networks, and the distinction between wireless and wireline, data and voice, disappears. Sprint is building the capability to open the wireless network to innovation, based on Internet technologies, in order to bring a wide variety of next generation multimedia communication services to our customers.

The business user will have a choice of devices with which to communicate, easily controlled and managed due to a common protocol (SIP). Not only will users will be able to connect to any authorised application – be it telephony, conferencing, video – from any handset or device, the user will have the ability to manage 'presence'. Presence has a powerful impact on work team collaboration and productivity: users can share their availability and predetermine how they want to be contacted in various situations. For instance, while in a meeting, an account manager can be sure to get the call from his or her customer, but see other calls via text message, or, while

closing a deal, the sales manager can find internal resources and managers immediately, and create a conference in real time. Presence management truly bridges the gap between the wired and wireless world by seamlessly routing communications between devices and locations.

Businesses will reap the benefits of unified networks, as we enable multiple services or applications to communicate between two or more points at the same time. Push to talk over cellular will include 'push to show', so that real estate, medical, public safety, and other professionals can send a picture or video while talking on their mobile device; the mobile worker can instant message from PCS phone to desktop, and turn that call into an instant conference, adding participants regardless of location, and adding visuals as needed; work teams in disparate locations can productively collaborate, talking while viewing and changing a presentation or document – whether on a mobile device, tablet PC or laptop; businesses will be able to quickly create an alert or notification message and distribute it as voice, text, and video to customers' mobile devices and laptops simultaneously.

'Sprint is building the capability to open the wireless network to innovation, based on Internet technologies, in order to bring a wide variety of next generation multimedia services to our customers.'

With ubiquitous unified network assets, Sprint's enterprise customers will be able to reap the economic benefits in terms of capabilities and cost, by keeping intra- and inter- company communications on one network, avoiding the costs of call termination charges to other service providers; essentially, we will be able to share the associated efficiencies and cost savings with our customer.

We can anticipate further integration of wireless technologies such as WiFi and mobile phones and, further out, fourth generation (4G) cellular networks capable of transmitting well over 1 megabit per second, which is faster than today's 2.5G and 3G networks. To achieve these higher transmission speeds carriers will likely require the use of a different area of the radio spectrum, such as the 2.5GHz spectrum band, currently referred to by the US FCC as Broadband Radio Service.

At this point, we envision open standards such as WiMAX opening the door to multi-modal forms of communication, and companies such as Intel and Texas Instruments are already developing chips to fit this standard. Mass adoption of mobile high speed data will accelerate as these chips become embedded in laptops and other devices.

This development will also have an impact on the service providers, as it has the potential to drive a shift in the wireless device (ie handset, aircard) subsidy model. Today wireless service providers typically subsidise a portion of the device costs. Under open standards, such technologies become affordable enough to be embedded within a wide range of near-ubiquitous devices, providing a wide range of business benefits from transportation to telematics.

Mobility is poised to make significant contributions to enterprise productivity, competitive advantage and increased customer loyalty. Enterprises are now able to take advantage of these potential gains when they embrace mobility as a strategic imperative and partner with broad-based service providers, such as Sprint, to make it happen.

For more information on Sprint see www.sprint.com

Integrating the new with the old

Mauro Sentinelli | Deputy Chairman, GSM Association,
formerly Managing Director, Telecom Italia Mobile

Mauro Sentinelli explores how service providers need to adapt their services to a user's situation as well as to the mobile device. He argues that recognising this and responding accordingly will be key to service providers' success. To foster innovation and remain competitive, mobile operators must effectively bring together the old, tested world of circuit-switched voice communications and the new, packet-based data world.

Telecom Italia Mobile (TIM) is Italy's leading wireless telecommunications carrier with over 26 million subscribers and a 43 per cent market share.[1] The company also counts 14 million proportionate subscribers outside of Italy. Annual group revenues were €9.5 billion with a 48.2 per cent EBITDA margin.[1] TIM has recently been integrated into Telecom Italia. The GSM Association (GSMA) is the global trade association which promotes, protects and enhances the interests of GSM mobile operators throughout the world, with the goal of making wireless work globally. At the end of 2004, it consisted of 650 2G and 3G operators and more than 150 manufacturers and suppliers. The GSMA's members serve 1.25 billion customers across more than 210 countries.

1. As of September 30, 2004.

There is a tremendous push towards the pervasive application of wireless technology in every field. In the corporate market it's the easiest sell because the benefits and business potential are clear.

Do you like to use your corporate applications in the office? Yes. Would you also like to access them on the move? Yes. Would you like to have an office which, instead of being just 16 square metres, is the whole world? Of course.

Employees can connect while on a train, on a plane, anywhere. Wherever they are, they're on the network, and this pervasive connectivity is now our easiest selling proposition. But despite the tremendous push towards pervasive mobility, a number of challenges remain.

> 'Would you like to have an office which, instead of being just 16 square metres, is the whole world? Of course.'

A landmark example of what can be done in the wireless arena is the unique service TIM is deploying with large cruise liners. We install optical fibres everywhere with a radio transmitter inside on clean frequency bands. The first we installed was on a large passenger ship: 1,100 crew members and over 2,500 passengers. We connected the ship over a satellite connection to our Italian GSM network. We offer the owner of the ship free calls for the crew within the ship, with passengers paying since this is an extension of the TIM network. For them, it is as if they were on land, calling on the TIM network with all the usual services including caller id and callback. They can even send and receive SMS and MMS messages, as well as use their GPRS data services. It has been a huge success: after four months all the channels were saturated. Now there is a queue of ships waiting for similar installations. So far we've installed nine.

> 'The user will embrace any technology as long as the device and the service are intuitive and well-adapted to it.'

The same kind of technology model can be used within corporations. We install optical fibres to transport 2G signals, 3G signals and WiFi signals. We allow our entire customer base to enter and utilise the plain connection – no server access – even though we provide this infrastructure for the corporation itself. We then cluster possible access-needs by employees within the organisation – consultants, for instance, and visitors. They connect to the local mobile switching centre we have built into the network and then select whatever service they need. Other people, meanwhile, will access a particular service using a suitable access code. And we have the capability not just to create two or three such clusters of different users within an organisation, but up to 120 or even more – each with different access or requirement levels. All this is mainly for data use, even if we do provide the 2G coverage. You could also bring voice onto WiFi. But in the corporate environment, of course, the most important thing is the data connection.

For the vision of pervasive business mobility to become a reality, it is paramount that service providers like cellular operators understand that the devices and the services, more than the technology, will drive adoption of mobility solutions. The user will embrace any technology as long as the

device and the service are intuitive and well-adapted to it. It is a fact that devices cannot fulfil all needs in all situations. At the end of the day professionals on the move use three devices to connect: a mobile phone, a PDA and a laptop. We may use our mobile phone to make the call, but we use a personal computing device – a Blackberry or other PDA – to manage the data and the laptop to perform interactive, detailed work.

My personal preference is to use both a smart phone and a PDA. They overlap in functionality so provide good backup if one fails. My Blackberry is really best only for email: it's too cumbersome for making a phone call. But sometimes when I am abroad, even if I have a GPRS roaming agreement with the roaming operator, there can be a misconnection with the Blackberry server in the UK. When that happens I know I can receive calls and email on my smart phone. So I have set up my smart phone to receive my email wherever I am as a back-up facility. And this means I don't have to take my PC everywhere – it weighs at least half a kilo, and then I have to worry about charging it. I am not alone. In general, business people above a certain level of seniority now tend to work with phone plus PDA, not with a laptop.

So in the current marketplace, the user is willing to live with multiple devices because that's how important it is to have constant, flexible and fast access to information. Service providers therefore need to adapt their services to the device and to the user's situation. Recognising this and responding accordingly will be the key to service providers' future success. It's all about understanding how a user's needs will vary according to different circumstances at different times and with different devices. Users allow no more than 30 seconds, say, to read or send an SMS, three minutes to check their PDA, an hour to work on their laptop. And that's why many new mobile services won't take off, I think, because they are not adapted to the device.

> 'In the current marketplace, the user is willing to live with multiple devices because that's how important it is to have constant, flexible and fast access to information.'

There's no doubt, in my view, that all narrowband services are going to migrate in one way or another onto wireless access. It could be the GSM family, UMTS, CDMA or whatever. Or high-speed data. Or maybe WiFi or WiMAX.

On WiFi, I do not believe that Public WiFi – the so-called hot spots – will ever have much chance of survival because it is an obvious example of a service not adapted to the devices used with it. Looking five years ahead I don't believe this will be very different. The reason is simple. Consider the current situation with terminals: even if you extensively cover a hotel, airport or

wherever, as a busy business professional on the move you just don't have the time to switch on the PC, wait for it to boot up, sign in and so on, all of which takes far too much time. In reality, you spend most of your time away from the office in meetings. You rarely have enough downtime to start up your laptop and work. Understanding this is the best thing we service providers can do, if we are to develop the most useful applications for our customers. Nobody makes any money out of public WLAN today, and if nobody makes money then it's not a viable business model.

> 'When I visit a customer I cannot afford to be unprofessional.'

But in the case where I would have a PDA with a suitable screen and WiFi connectivity, then that becomes very useful. For instance, I can then download a large file while waiting in the airport check-in line, review it on the plane and then upload my request for changes at the closest hotspot upon landing. Someone else can then make the changes for me, so I can download a final version before entering my meeting at my destination.

In addition, when I enter the meeting room, if I can then command another device in there such as the presentation beamer using my PDA with a suitable Bluetooth connection, then that becomes very interesting. When I visit a customer I cannot afford to be unprofessional. In such situations WiFi would allow me to download a 5MB or even a 10MB presentation in a few seconds, and so be able to make final changes or incorporate the latest information into my materials. People on the move rarely have an hour to spend to boot up their PC and work.

Without suitable devices to allow you to spend the time you have available in the most efficient way, there is a serious mismatch between customer and service provider – and WiFi and other mobile technologies will never fly. When they do, it will be because you don't have to boot up anything, and because the device is always on and it's a colour screen, and so on.

For all this to happen, we service providers need to successfully bring together the old, tested world of circuit-switched voice communications and the new, packet-based data world. The circuit-switched world has been standardised over a hundred years. We have reached a certain level of sophistication and complexity, and we understand very well what we are talking about and how to operate it and how to evolve it. And these circuit switched networks are really very well optimised.

For example, up to now we have not had a more efficient method of transmission than mobile voice over half-rate GSM. The half-rate GSM circuit switched mode is the most efficient approach today. And, by the way, when

we started to try to bring on IP technology it was a disaster. When you put voice into packets over the air, you significantly increase the bandwidth you need because each packet requires an individual header and tail. Even if you compress everything in the header in the most efficient way, the payload is no more than two-thirds of the overall block to be transmitted. Of course, this is a highly inefficient method in the wireless arena where bandwidth is limited. In the fixed world, where bandwidth is more plentiful, this is less of an issue. So a disaster, as you can see – not least because we in Europe paid between €2.5 billion and €5 billion for just 10 megahertz in UMTS.

Yet we are moving towards an 'all packet' wireless network (not necessarily 'all IP'). And the fact that we must deal with the two worlds of circuit and packet can be seen in every service we deliver. For example, an MMS service requires the combination of both circuit-switched and packet systems, which are driven by two different protocols. I send you an MMS by sending you an SMS to wake up your phone, then I order your phone to wake up, and then the phone will download the MMS from the MMS centre. The downloading is done in packet mode, driven by the Wireless Application Protocol. Yet the SMS was sent using circuit switched mode, driven by the CCITT SS7 protocol, so in many cases there is no cooperation between the two. The circuit switched system doesn't know anything about whether the video was successfully downloaded. If it did, a second signal could be sent to retry in case the download was unsuccessful.

'The fact that we must deal with the two worlds of circuit and packet can be seen in every service we deliver… The lack of integration between the two systems will pose significant difficulties if we are to achieve our goal of […] offering our customers pervasive services to support their mobility needs.'

If we do not solve this problem effectively, then the lack of integration between the two systems will pose significant difficulties if we are to achieve our goal of moving towards an all-packet world and offer our customers pervasive services to support their mobility needs.

And this is where the value proposition lies for mobile service providers. Wireless will never be able to fully substitute fixed connections, since the bandwidth just doesn't compare. The future, then, will still have a place for both fixed and wireless communications. The future success of wireless services, however, will depend on how well they interconnect with and complement fixed communications. Mobile adds value because it works while people are on the move and above all it is personal. Even if I use it in a professional context it is personal – this phone or this PDA is mine and I carry it with me an as extension of me.

The future success of service providers such as ourselves will depend on our ability to accommodate and personalise the constantly shifting connectivity requirements of our customers 24/7, wherever they are in the world.

For more information on TIM see www.tim.it
For more information on the GSM Association see www.gsmworld.com

Adapting for the future

Arun Sarin | Chief Executive Officer, Vodafone Group
Alan Harper | Group Strategy Director, Vodafone Group

Mobility, driven by voice calls, has been the most important development in telecommunications. Arun Sarin and Alan Harper describe how we have now entered the next wave, which concerns how to enable corporate applications on any device, any place at any time. To successfully offer such complex solutions, mobile operators must increasingly partner with other players. They must also adapt their business models to stay in touch with continuously evolving customer needs and ensure fast solution development cycles.

Vodafone Group Plc is the leading mobile telecommunications company worldwide. The group has equity interests in 26 countries across five continents and partner networks in a further 14 countries, with almost all subsidiaries operating under the Vodafone brand. The proportionate, registered customer base was over 151 million by end of 2004, and group turnover was at almost $62 billion in fiscal year 2004. The company's vision is to be the world's mobile communications leader, enriching customers' lives, helping individuals, businesses and communities be more connected in a mobile world.

Vodafone is one of the world's largest mobile operators. Mobility is central to our business and to the business of our customers and business partners. For the time being, our main focus – and that of our business customers – is the mobilisation of existing applications to improve efficiency. Mobility's next wave, however, will require all of us to ask:

How can we actually improve on mobile applications?

How can we push mobility further onto the next stage?

Already, mobility is changing our own business model in quite significant ways. Future changes to business practices across industries will be even more considerable. The real challenge for us will be to stay ahead regarding what mobile technology and applications can do, to stay in touch with evolving customer needs and to continue to evolve our products and services at an increasingly rapid pace.

The market uptake in mobility solutions requires us to speed up our production and development cycles, just to keep pace with increasing demand. This adoption means that we are placing a greater emphasis on working more closely with our customers to jointly develop solutions. We must ensure – especially for big enterprise customers – that we have more people spending more time working with our customers on their premises. The IT industry has been doing this for a while now, but it's not the way mobile companies or most telecom companies have worked. It's an important change because we need to get closer to our customers to understand their needs and work with them to come up with solutions.

We are working to make these solutions easier to use – in fact, ease of use rather than cost is now the significant barrier that needs to be overcome for full adoption by businesses. So it's much less a question of whether mobility is affordable.

> 'The real challenge for us will be to stay ahead regarding what mobile technology and applications can do, to stay in touch with evolving customer needs and to continue to evolve our products and services at an increasingly rapid pace.'

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Our mobility vision can be seen both within our own business and across the range of products and services we provide to our customers. One example of how mobility impacts our own operations is in our recently completed new UK headquarters, which has no fixed telecoms infrastructure and where mobile and fixed voice applications are now fully integrated. So you can have both a fixed telephone number and a mobile telephone number on one phone, but irrespective of whether someone phones the Vodafone phone number here in Newbury or the mobile number, the same phone rings and you can't tell which number was called. You can deal with callers here in the office, elsewhere in the country or indeed anywhere in the world and they're none the wiser.

There are also other ways in which we are developing mobility for our own internal use. One example is non-voice applications such as video streaming and video messaging – we are currently assessing options to stay in better contact with remote staff. Today we have very simple mechanisms for sending out messages to our employee base. Now, as the technology evolves, we're beginning to explore whether we can create a 'Vodafone TV'

service to reach our staff. We could do that now via a laptop and tomorrow via mobile phone. And this could offer real business benefits as video streaming can really bring both leadership messages and corporate culture to life more vividly than a quarterly newsletter. Currently, we send out a monthly email to staff talking about corporate priorities and key messages. Through 2005 we aim to evolve this – not just delivering corporate messages via email but with video to mobile handsets. This should create a lot more personal buy-in and understanding.

Then there's the growth of remote working as Vodafone's own workforce becomes more mobile-enabled. We wish to allow our employees to work easily anytime, any place, anywhere.

'We are keen to explore ways to enable customers to have a single device that works both in an office environment and when they are out and about.'

In terms of the products and services we provide our business customers, a growing emphasis is being placed on smart phones, Blackberry-like devices and PCMCIA cards to meet rising customer demand. We see significant potential for a new generation of messaging devices as business messaging grows, fuelled by the uptake of devices such as Blackberry. And as mobile phone technology improves with higher speed data access such as 3G and HSDPA coming along, we're finding more and more customers relying on data cards and laptops as a means of accessing their corporate networks. Integration of mobile and laptop is already happening in the marketplace and we forecast this will grow – probably led by larger corporate clients. That said, some smaller businesses are actually at the leading edge of this because a ten or 15-person office is unlikely to be able to afford a dedicated telecoms or IT manager, so they want maximum flexibility built in from the start. The new approach is companies saying: 'I don't actually care how these services are provisioned in technology terms, all I want is to have efficient, reliable, cost-effective voice and efficient, reliable, cost-effective data applications. You work out how to provide it, Vodafone, thank you very much.'

Another growing area for us is the development of mobile phone service authentication for such usage as access to transport systems as a means of collecting payment or participating in payment mechanisms. In East Africa and some of the South East Asian markets, where the mobile phone is ubiquitous, we are exploring ways to use mobility to create financial exchange mechanisms for local businesses whose nearest bank may be a few days walk away.

To explain our mobility vision it's important to emphasise our belief that more and more, mobility is no longer just about keeping people connected.

Staying in touch, of course, is an essential part of any business, anywhere, be it via voice applications or over data services. But simple-to-use, integrated services are really the key for businesses. Over the past decade we've moved from a position where being contactable 24/7 was important for certain sectors of the workforce to the current situation where it's relevant to almost everyone. This has been brought on by the penetration of mobile phones – voice communications and text messaging have now been with us a long time. Today, messaging solutions, Blackberry-type applications, and laptops enable people to be connected faster, more easily and more efficiently. In addition, mobility is also extending into machine-to-machine communications.

It's been interesting talking to people coming back to work after the Christmas break who've said, 'Yes, I've had a good period off – ten days over Christmas and New Year – and I've been able to stay in touch.'

Of course there are two sides to this coin. Some might say they've not been able to switch off. But the positive beyond that is it's easier to relax when you feel in touch and in control. So you don't have to come back to countless emails in your inbox because you've edited them at your own leisure. People have become much more productive without really feeling more stressed. There's less time to sit and think, perhaps, but on the other hand you can achieve so much more as an executive in business now than you could 30 years ago.

And when you consider for example the Tsunami disaster that happened in South East Asia in 2004, it's obvious that many people valued the ability to stay in touch, especially since they weren't necessarily sure of each other's whereabouts. It's a very unfortunate example, but it is – in some ways – a good illustration of how the technology has really allowed a greater efficiency. This technology has enabled businesses and relief organisations to respond very quickly despite the fact that business was pretty much closed down because of the Christmas break.

The reasons for investing in mobility vary, of course. There are some applications which have become essential for doing a job. New recruits in many companies are increasingly likely to be given a mobile phone rather than a fixed line phone as people work more in multiple locations. Voice communications and e-mails are no longer luxuries: they're efficiency items and basic essentials. Clearly there are additional factors which are about driving for business efficiency in new application areas, or driving for cost reduction. And that's where I think you get into the new – particularly data – applications that we're beginning to see develop. Field force information, sales force information, asset tracking solutions: are all clearly about seeking greater business efficiency. You're unlikely to buy basic mobile communications because of these efficiencies, but having bought the basic mobile communications – the standard efficiency items – these then come along as valuable extras. And that's really where we see some of the growth coming from in the future.

We see a large and mounting uptake of mobile applications. More business people today have two or three connections as they tend to use multiple devices to be connected. There is also demand for solutions that integrate applications into a single device. Mobile phone penetration above 100 per cent is becoming common in particular business sectors and geographies; Scandinavia and southern Europe are fast approaching that point. Ease of use – both for voice and data applications, however, remains a barrier to some applications and we are working on ways to overcome this by making usage easier. We are keen to explore ways to enable customers to have a single device with voice capability that works both in an office environment and when they are out and about.

That said, in our experience business customers so far prefer to have a specialist device for messages rather than just using a mobile phone, which is still thought of as a voice device. So there is a preference for dedicated Blackberry-style devices rather than messaging within a multi-purpose handheld or laptop. Clearly there are times – such as when you're at home, or when you get to a hotel in the evening if you're travelling – where you can set up a laptop for an hour or two and it's worth the effort to power up and log on. And there are times when you sit in an airport departure lounge with half an hour to kill when, again, it's worth doing. But for grabbing five minutes between meetings, or travelling in a taxi between clients, it's not appropriate to power up a laptop.

We anticipate two key elements relating to how mobile devices will evolve in the future. First, they will become integrated into multi-purpose terminals. Second, specialist devices will evolve specifically designed for heavy users – for example, devices dedicated to music downloading, or intensive messaging. Ultimately, if you want to carry around 40 gigabytes of music you're going to buy a specialised mobile music device but if you want to just have some music on your mobile phone, you will be satisfied with that device: the two can and do co-exist. The same is true for games. Clearly there's some overlap and a degree of cannibalisation at the edges, but fundamentally different devices will be used for different purposes because, as we have already seen in other industries, when you try and get one device to meet all needs, it either becomes very complex and very expensive or it tends to address the lowest common denominator.

This situation of multiple user devices raises an important topic: the user profile. Already, in some cases we are providing multiple SIMs for a single account. If you're looking for incoming messaging, then if I'm emailing I know that I'm sending it to an email address, typically, rather than a SIM address. Three of four years down the line as people start to have something like 'universal personal identity' rather than an email address separately from a mobile phone number, clearly that might change. But in the short term I see little problem integrating these multiple identities because typically the multiple identities have unique addresses. When managing an email address,

all your access, the Internet, website and intranet services through a laptop or a mobile phone you've got a return address that identifies that individual. But if people start saying they want to integrate this more into an office telephone number and a mobile telephone number and to have multiple email addresses – business, home and so on – integrated into a single device then service authentication user identity and managing those multiple identities on a single device or suite of devices becomes more important. And that's part of the architectural and technology evolution that we see.

There are some key issues relating to mobility that must be addressed. Security in mobility is critical – especially post-9/11. As companies increasingly appreciate the value and business benefits that mobility can deliver, they also begin to understand how they need to think about mobility and mobile solutions in a different way. But many corporate customers have really not dealt with mobile communications in the same way as they would have dealt with, say, fixed communications, PBX and fixed networking, or the provision of an IT infrastructure. The idea that as a large corporate you would allow your employee base to just turn up and organise their own fixed telephone service or organise their own PC connection is unthinkable. But that's exactly what many corporates have been doing with mobile phones for years.

'The idea that as a large corporate you would allow your employee base to just turn up and organise their own fixed telephone service or PC connection is unthinkable. But that's exactly what many companies have been doing with mobile phones for years. They must view mobility as part of the integrated corporate solution and as something that has to be provisioned in a secure way.'

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Now, as corporates change their view of mobility, they need to start thinking about mobile much in the way they think about IT or fixed telecoms. They must view it as a part of the integrated corporate solution and as such something that has to be provisioned in a secure way. This applies to how it connects to other parts of the technology infrastructure within an organisation and how it accesses databases and information that exists within the corporate. Increasingly, vital business information is being carried around on mobile devices – be it laptops or mobile phones. If you have access to a Blackberry then you have access to a person's email and all of a sudden you have access to a lot of information about the company. Equally the security of the mobile phone itself as it becomes more like a PC – the ability to download applications to a mobile phone for example – means it should be treated much more like a PC. We all face these same security issues as the mobile world moves beyond just basic voice into other applications

Convergence is another important topic. Integration of the mobile and fixed-voice applications is already occurring within Vodafone and it's also happening more and more for our corporate customers. So we are now packaging products like the On Campus solution to wireless office-type solutions that look at how we can provide an integrated solution to the corporate customer for voice communications and, increasingly, for data as well. This means customers can rely on having just a single mobile phone as their voice device and a laptop as the ubiquitous data access device. Whether they plug into a cable-based solution in the office or whether they're out and about it's the same corporate system.

> 'In the past our product was simple. But as you move into more complex solutions, then business partnerships to meet customer needs become more important, and that creates a new business setting that we need to work in. Few – if any – players in the supply chain can meet all of the customers' evolving needs.'

A rising number of larger customers, meanwhile, are looking at ways to integrate mobile and fixed voice applications and we are responding to that. We believe what you can do with the technology matters more than what the technology is. Businesses are in the end excited about whether they can actually be more efficient in running their business. Increasingly some of our big corporate customers are saying: 'We spent X on mobile and Y on fixed voice and data communications. If you can give us a solution for all of it and you can give it to us at a more cost-effective price than we currently buy it then we're very open to having that packaged solution.'

This is impacting how we create solutions for these customers. In the past our product was simple. But as you move into more complex solutions then business partnerships to meet customer needs become more important and that creates a new business setting that we need to work in. So understanding how to actually build working partnerships, how to create shared branding and joint solutions for corporate customers represents a new set of changes for us.

When all we sold was mobile dial tone, frankly, we didn't need anyone else – we bought standard infrastructure and standard handsets and we sold a product to customers on our own. As we get into more sophisticated, all-embracing service packages, however, we need to work with business partners. Few – if any – players in the supply chain can meet all of the customers' evolving needs. So we identify the appropriate part of the package that we think we can contribute most to, and present that in the most attractive, easy-to-use proposition for the customer.

All of this is changing the way our customers see us. Some customers clearly see Vodafone as a key interface, a key relationship, and that's great. Others would prefer to work with somebody else as their primary interface, and in that sense Vodafone becomes a part of the solution offered to the customer by one of our business partners. Both models are fine by us and work perfectly well as long as we're both clear with our business partners and the end corporate customer about what the added value Vodafone can bring is. Certainly, we can be the primary point of contact for some clients, but it doesn't work in all cases so we must be increasingly flexible.

Many new players now play a crucial role in the market for mobility. The rise in interaction between the mobile industry and digital content industries for example presents some interesting new business models and some challenges to existing business models. More digital cameras are currently being sold in mobile phones than on their own. A huge amount of storage capability in mobile phones is being used for storage.

A fundamental challenge all this presents is the need to remain flexible. Solutions must be tailored – one size does not fit all. And while there are clear global trends in the mobile marketplace, local differences must be taken into account. Of course the geographic reach of a company, its size and the make-up of the industry in which it operates matter. But ultimately, the drive for enhanced productivity is ubiquitous.

Of course companies of different sizes have very different needs. And markets are very local – even within Europe there are substantial differences from market to market. So while we can look for the global scale and the synergy that fits, it's also critically important to maintain local contact with the market and make sure we can meet local needs. Ultimately, however, it's doubtful that the differences are very significant. The drive towards greater-value delivery is universal, as is the interest in new business applications and the mobilisation of the workforce. The factor that truly differs from one market to another is what's at the leading edge.

Meanwhile, the needs of business and personal customers are starting to overlap quite considerably in all segments. All of us feel the stress of exactly where our private life ends and our business life starts and always being in touch is both a burden and a benefit. This applies whether you're in a small business or large one, whether you're in your office or on the road. The value of ubiquity of contact and ubiquity of access – to information, clients, suppliers and staff – is universal to all organisations, irrespective of status or size. So it's essential to perfectly understand customer needs and adapt to them, rather than try to develop a one-size-fits-all solution.

In the light of 3G and other emerging technologies offering faster access, we'll see a move from the current focus of mobilisation of existing application to the next stage – increasing the efficiency of all mobile

applications – over the coming years. The real challenge will be to understand what customers are doing today to work out not how to force them to change their business processes but to mobilise them to improve efficiency. But this will take time, because you can't just change the mobile part of it – you have to go back and change the overall system architecture and that's a very big decision.

So the fundamental issues of the way mobile applications and technologies will change enterprises is a fascinating area. What will an enterprise look like in five, ten or 15 years' time? Where there's no longer a workforce that comes together regularly, how can you maintain a unique sense of identity across the company? Building teams is much more challenging when people aren't always together. So all sorts of challenges related to running a modern, efficient enterprise will become even more dominant.

'The drive towards greater-value delivery is universal, as is the interest in new business applications and the mobilisation of the workforce.'

Mobility has had a profound impact on how we at Vodafone organise our work. Our teams no longer need to be physically co-located to work on a project. You can have common team rooms, you can have shared work environments, you can have more conference calling, you can have lots of different forms of shared work space as well as occasionally sitting down round a table and working on a problem together. Some companies are at the leading edge of this, more will get there in time. Clearly mobile technology in its broadest sense – not just pure 3G and GSM cellular-type mobility, but any type of wireless technology that allows much more personal identification and user operation focused on the individual instead of physical location – enables that sort of change and dynamic within the working environment.

Without doubt, mobility will have a significant impact on organisational structures and processes. If you go back 20 years – to the time of the first mobile phone call in the UK – mobility didn't exist. Even ten years ago mobile penetration in the UK was just around 20 per cent. It was a premium business product, and it was just voice. The mobile world that we talk about so easily today didn't exist. So, given that we're on an exponential curve, in ten years' time the world will be a very different place. It's hard to predict just how, but what is clear is that the real focus should be on how to stay in touch with what the technology can do, what the applications can do, what the customer needs are and to continue to evolve at a very rapid pace.

For more information on Vodafone see www.vodafone.com

Mobility and society

SECTION 3: MOBILITY AND SOCIETY

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3

The source of innovation

Howard Rheingold | Author

Users drive innovation. In our connected world, Howard Rheingold observes an increase in global collective action, as people and causes gain from collaborating. He argues that the smart enterprises and operators are those that become enablers, letting employees and users explore new technologies in order to reap the benefits of innovation and turn it into profit. The advent of mobility is revolutionary in how it enables people to collaborate instantly, regardless of location.

It is in our nature to invent ways of communicating; it is what makes us uniquely human. What began a few million years ago with a gesture, and progressed to a grunt, then a mark scratched on a piece of clay, has today taken us to the World Wide Web, WiFi, SMS, the camera phone… and who knows where and what tomorrow?

Every step of the way, new media have been created not so much from the top, through corporate research and development, but from ground level: the users themselves, exploring the technology and taking it further than its inventors ever dreamed. When Alexander Graham Bell invented the telephone in 1875, it was not at first seen as a serious rival to the telegraph network. Nor did anyone imagine it would become an instrument of social communication. As for *women* using it – well, surely there was no reason for them to go anywhere near a telephone?

A decade ago, no one could have guessed at the runaway success of SMS. Today, the way kids are using camera phones is hardly what the operators predicted either. Educated young people created the Internet, Apple, Microsoft, Google, the communications systems we now take for granted. But you do not need education to innovate; you just need access. There are now a billion and a half mobile phones in the world. Those phones are already knitting people into new networks, where they will teach each other to innovate for themselves.

But how will that impact on our businesses and workplaces? The smart operators realise that by letting people explore new technology, they can reap the benefits of the innovation that takes place every time somebody uses it, and turn it into profit.

From Darwin to democracy

We have become used to thinking of development as a kind of Darwinian evolution. Biology is war, the old story goes, where only the fiercest survive. Businesses and nations succeed by dominating, destroying or defeating their competitors. Politics is about your side winning at all costs.

3.1

But increasingly a new narrative is emerging in these different fields, one in which cooperation, complex interdependencies and collective action plays an enhanced role. The lever for cooperation is self-interest; you help others because you gain something from the transaction. The development of new communication technology is no exception; indeed it drives the very possibility of change, and is a key part of its democratisation.

> ‘Every desktop connected to a network is a printing press, a broadcasting station, a place of assembly and a marketplace. More recently, that power is leaping off the desk and into the hands and pockets of billions of people all over the world. Mobile communications will prove just as revolutionary as the invention of the printing press.’

As far back in human history as you can go, people have been organising into social groups and cooperating. The earliest hunters evolved language by signing to each other to make it easier to chase big game, and generate wealth in the shape of more protein for the group. Once settled agriculture started, and cities grew, it did not take long for writing to emerge as marks on clay out of the administration of those empires, keeping track of the wheat, the sheep, the wine and who owed taxes on them. The alphabet – the secret code for transmitting knowledge across time and space – was handed down from one administrator to another, over thousands of years. Literacy was confined to an elite.

Then, in the 15th century, the invention of the printing press unlocked this secret language and made it available to the masses. Within decades, millions had access to the power of written communication, and it is no coincidence that this is the time new forms of collective action sprang into

being: scientific revolutions, Protestant reformations, constitutions, even different ways of enriching people. Markets are as old as the crossroads, but capitalism dates back a mere 500 years or so to the joint stock ownership company, the shared liability insurance company, and double-entry bookkeeping, all of which were media that enabled new forms of economic collective action to open new paths to wealth.

We are going through a similar period of change today. Every desktop connected to a network is a printing press, a broadcasting station, a place of assembly and a marketplace. More recently, that power is leaping off the desk and into the hands and pockets of billions of people all over the world. Mobile communications will prove just as revolutionary as the invention of the printing press. They give people the opportunity to organise and co-operate in new ways.

New players in a global game

In some parts of the developing world, the use of technology is leapfrogging even that of the West. It is often easier and quicker to put in cellular towers rather than landlines in rural areas, so the use of mobile phones and wireless networks is growing exponentially. In remote places they enable people for the first time to be players in the global economy rather than pawns. These are individuals who may only be making pennies but there are billions of them, and until now they had not been allowed in on the game.

Small farmers in developing countries are among the world's most disadvantaged economic players. Traditionally they have had no choice but to accept the prices offered to them by unscrupulous middlemen, because they did not have access to timely information from commodities markets.

> 'In the next few years, in China, India, Africa and South America, vast numbers of people will at last win economic advantage by gaining access to mobile communications and information. What more will they invent?

In Kenya, a private firm, Kenya Agricultural Commodities Exchange (KACE) is now selling market information to farmers via SMS, by contracting with an African mobile phone service provider.[1] With 11 low-cost access kiosks too, the service is already demonstrating that the bottom end of the information market has to be just as competitive as that aimed at wealthier clients. No one claims this service can reach the very poorest farmers, but as it begins to alter the balance of economic power the benefits could filter down to all.

Meanwhile in Peru, The Agricultural Information Project for Farmers based in the rural Huaral Valley offers a network of wireless-connected, community-based kiosks to make available agricultural market information, as well as practical advice on plant disease prevention and farming methods. It also helps coordinate another essential resource: irrigation water. The project is supported by a coalition of NGOs, local institutions, Peru's Education and Agriculture ministries and European development organisations. Together they raised $200,000 for two urban kiosks with ADSL links, and 12 rural telecentres with WiFi links. The plan is to generate money from using the facilities as Internet cafes and become economically self-sustaining within three years.

These are not the only initiatives, and the possibilities are endless. Fishermen at sea will be able to discover which port to put into to sell their catch at the best price: where there is a glut, where there is demand. In the next few years, in China, India, Africa and South America, vast numbers of people will at last win economic advantage by gaining access to mobile communications and information. What more will *they* invent?

3.1

Being open to possibility

If we are not to get left behind, as operators or business users of mobile connectivity, we have to do some smart footwork to keep up with what is already happening at ground level.

The most important lesson, I believe, is to be open to possibilities. We need to be alert, especially to opportunities for cooperation and collaboration. Could the Internet have developed into the World Wide Web, or indeed anything significant at all, had its founders been forced to deal with the kind of establishment that currently pervades the mobile space? Operators today are rarely innovative, but essentially conservative; it is hardwired into their DNA. But it is possible to profit cooperatively from innovation, even if the big idea is someone else's. Operators must become *enablers*. The more open they become – essentially the more they stop standing in the way of progress, even though it feels as if it has been wrested from their grasp – the more new markets will open up for them too.

Think simple

One lesson we can learn from users both in the developed and the developing world is that sometimes it is important to think uncomplicated. Ease of use was what gave SMS its initial success. But already it has become a tool far more potent than the ability to send a message saying *I'll be home in 15 minutes*. People are discovering the value of being able to send an SMS to a database, and to get back just the single datum needed right now.

You send a query; you get an answer. There may be a lot of hardware and software behind it, but the act itself is a simple one. Mobility must allow you to piggyback onto a database or the Internet, and interrogate it in one easy action. For the fisherman it is which port to put into; for the farmer it is up-to-the-minute commodity prices. You simply need to identify the right question for your own enterprise, the timely piece of information you need to know on the spot.

1. The following content relating to the role of mobile technology in the developing world was originally published on TheFeature.com, and is reprinted here with permission.

Alternatively, we could expect the information to come to us without having to ask, predicated by where we are and what we are doing. Streams of information can be travelling out to the mobile handset all the time. We can choose to pick them up or not, to subscribe and unsubscribe at the press of a button.

Billing

The problem for businesses trying to make money via the Internet has always been the question of how to collect payment. What gives mobile operators an advantage today is their billing system. Any service you subscribe to or any goods you want to buy via your mobile can simply appear as a line item on your phone bill.

Again this is an opportunity for operators and business providers to work together to expand the range of services available through the mobile handset, and to streamline the means by which the customer taps into the service. The solution might be a combination of SMS and barcode technology. A concert promoter, for instance, can offer the option of booking tickets via SMS, or a store might enable customers to order groceries to be picked up on the way home. In response to the SMS activating the transaction, the service provider issues a barcode, which is transmitted back to the handset. The customer then shows the barcode to be scanned at the turnstile or the checkout. Billing takes place safely and securely, through the telephone company. It works; it is debugged, universal and, most importantly, *trusted*. Even when more traditional areas of business are threatened, operators will still have this huge advantage and opportunity. All it takes is to be flexible, and alert to possibility.

The guy in the basement: how to manage mobility for the workforce

It is not so much a question of *inventing as discovering* what is already there. Business organisations are in just as much danger of atrophied thinking. I sometimes muse on how difficult it was to get even the PC into some workplaces. I met managers who considered that having a keyboard in their office was not prestigious. Keyboards were for secretaries. When I wrote *The Virtual Community* in 1992, most of the big telecommunications operators on every continent not only exposed ignorance, but even expressed contempt for the Internet. I went to some of the big human interface labs to demonstrate what it could do for them; nobody among the research managers knew how to find an Internet connection, although it is a safe bet that some 19-year-old engineer down in the basement was online. Generally the literacy about how to use the tools lags well behind their adoption.

If you leave it to the top levels to initiate change, most corporations or business institutions are resistant to innovation. However much they pay lip service to invention and development, it is not in their nature to embrace it. Yet each one of those hidebound institutions is packed full of innovators. A smart organisation is a sensitive organisation. It knows how to step aside to let its own people get on with showing how inventive they can be.

The adoption of the tools tends to sneak in through the back door with younger employees. New hires bring into the organisation their communication practices from high school and college, the old folk retire and younger talent rises in the organisation. The newer the company, the greater the innovation, because it begins with less of the legacy of *how we used to do things*.

'The smart organisation is a sensitive organisation. It knows how to step aside to let its own people get on with showing how inventive they can be. The newer the company, the greater the innovation, because it begins with less of the legacy of how we used to do things.'

3.1

Unless you intend to start a brand new company every couple of years, you need to find out what is really happening in the basement in your own organisation. Do not be tempted to waste time and money setting up an elaborate system of focus groups and surveys. People in focus groups and surveys don't tell you really how they do things, as Xerox discovered in the 1980s. Instead they employed an ethnographer to follow round their photocopier repairmen in Silicon Valley, who revealed an altogether different picture. It turned out that repair staff passed on tips and short-cuts over a beer after work, and so it was often someone who was not necessarily the designated IT person – usually a secretary – who actually knew how to get things to work when the manual couldn't help.

I have every sympathy with IT people. They have the thankless task of supporting an entire workforce with a set of devices not everybody understands or even wants to use. But far from being the people to solve your communication problems, I would suggest your IT department may well be one of the barriers to best practice. When someone comes along with a bright new idea, IT rarely have the time to give it proper consideration. They are usually more interested in whether it will fit with their existing database infrastructure, than whether it will enable people to be four times as productive out in the field.

So who is the person in your organisation who really understands the new tools? The body of knowledge that already exists within the company might surprise you. The pioneers of mobility are the teenagers buying and using the latest phones, and the 21-or 22-year-olds just entering the workforce. Just as ten years ago you would have looked to find out what the guy in the basement was doing with the Internet, today you should find out what your 21-year-old newly hired employees can tell you about mobility.

Pain relief

But how to sell the idea to the more reluctant sectors of the workforce? The real challenge is how to progress the cultural change associated with adopting new practices. Some people will see mobility as freedom, while others resist it as an infringement upon their freedom. After all, mobile communications enable your boss to find you in more places more frequently.

The trick is to package mobility as *pain relief*. Few people want to do things *better*, because that means changing their work habits. But everybody has something painful going on in their working life. Offer them a solution, a headache pill, and watch them snatch it from your hand. Once you have a success story – if someone in the next office or in a different division is doing something that's getting them ahead – then the message spreads.

Perhaps you have a product that is software-based. Your programmers are constantly changing the product, in response to the market. Your sales team are out all over the world selling it. The sales people come into headquarters at different times and only get together once or twice a year at a sales conference. They use PowerPoint presentations. How can they share them? Do they all have to reinvent them individually every time they make a change? The customers give them feedback about the software. How do they get the message back to the programmers? If you can find a solution to relieve that particular pain, suddenly people will see there could be something else it could be used for, and will start looking at how they can adopt a similar practice elsewhere.

Culture change

Mobility can be pain relief, but it also raises some bigger issues about workplace culture. In the past, communications traditionally flowed downhill, and were in effect one-way. The boss called the employee and gave instructions; it was less usual for the employee to call the boss. But now a manager has to keep his or her phone switched on at all times, because if subordinates encounter a situation that requires a decision and the manager is not available, they will take the decision on their own, leaving the manager to carry the can for the consequences – after all, he or she didn't respond to an immediate need for involvement.

For that matter, employees at *all* levels become more exposed because they are now supposed to be reachable. Little wonder some people resist mobile connectivity.

Organisations have to manage the cultural change sensitively. Being an employee is not a person's entire life. Unless some sort of limits are imposed, mobility means you take your job with you everywhere you go, so workplaces need to put thought into finding a system of best practice.

Sharing economies, opening futures

We are only just beginning to tap the possibilities of mobile connectivity. There are already more than a quarter of a billion mobile phones in China, and 150 million mobile phones are projected for India by 2007. In the realm of politics, in the Philippines, in Korea, in Kenya, in the USA, citizens using mobile phones and SMS messages organise political demonstrations, coordinate get-out-the-vote campaigns and monitor elections. They depose heads of states in some places and elect them in others.

We now have the opportunity in an instant to tap into expertise and bring together people from places we would never have been able to reach before. Virtual communities are springing up all the time, some non-profit-making, others creating new wealth. Even traditional corporations have woken up to the idea of forming networks and sharing economies; the pharmaceutical company Eli Lilly, for example, has created InnoCentive, a virtual scientific community and marketplace for research solutions. Imagine how powerful and immediate a tool for problem-solving these networks will become if we add mobile connectivity to the equation. Already global communications allow us to outsource operations such as medical transcription to parts of the world where labour costs are cheaper. When people routinely carry with them mobile devices, it could be possible instantaneously to enlist thousands of experts worldwide with particular skills and qualifications to set their minds collaboratively to a task.

'We now have the opportunity in an instant to tap into expertise and bring together people from places we would never have been able to reach before.'

Imagine too a world where unused computing power itself is shared or hired out. At the Shibuya intersection in Tokyo, 1,500 people cross every time the lights change, and most of them are carrying mobile phones. What if the surrounding offices contracted with them to hire their combined computing power for the 90 seconds it takes them to cross?

It would be naïve to claim to be able to predict what could spring from the combined untethered technologies of the PC, the mobile phone and the Internet. All that can be said for sure is that the possibilities are as endless as is the inventiveness of humankind. Our task is to be open to those possibilities, or we shut ourselves out of the future.

For more information on Howard Rheingold's work see www.rheingold.com

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INTERNET BUSINESS SOLUTIONS GROUP (IBSG),
EUROPE, MIDDLE EAST AND AFRICA (EMEA), CISCO SYSTEMS, INC

Anja joined Cisco Systems in January 2000 to help set up a group to offer business planning support to telecommunication operators. She is now a member of the Internet Business Solutions Group, responsible for business consulting activities with mobile operators in EMEA. This includes defining new services to take to market as well as leveraging Internet business solutions to help improve business performance.

Prior to working with Cisco, Anja was with Mercer Management Consulting based in Munich and London. Her projects included advising several telecommunication providers on strategic issues, especially in Scandinavia.

Anja holds a triple master's degree in Management from ESCP-EAP. She is a Danish national currently based in Amsterdam. She speaks fluent Danish, English, French and German as well as conversational Dutch.

Nikesh Arora

VICE PRESIDENT OF EUROPEAN OPERATIONS,
GOOGLE,
UNITED KINGDOM

As Vice President of European Operations, Nikesh Arora manages and develops Google's operations in the European market. Responsible for continuing to create and expand strategic partnerships in Europe for the benefit of Google's growing number of users and advertisers, Nikesh is a pivotal member of the senior management team at Google.

Coming from an analyst background, Nikesh's main areas of focus have traditionally been consulting, IT, marketing and finance. Prior to joining Google, he was Chief Marketing Officer and a member of the Management Board at T-Mobile. At T-Mobile, he spearheaded all product development, terminals, brand and marketing activities of T-Mobile Europe. He started working with Deutsche Telekom in 1999, during which time he founded T-Motion. Prior to his career at Deutsche Telecom, Nikesh held management positions at Putnam Investments and Fidelity Investments in Boston.

Nikesh holds an MS and CFA certification from Boston College, and an MBA from Northeastern University, all of which were awarded with distinction. He has served on the Adjunct Faculty at both Boston College and Northeastern University. Nikesh also graduated from the Institute of Technology in Varanasi with a bachelor's Degree in Electrical Engineering in 1989.

Fergus Boyd

SENIOR MANAGER, TECHNOLOGY EXPLOITATION,
BRITISH AIRWAYS,
UNITED KINGDOM

Fergus Boyd is a Senior Manager in BA's IT department. He heads up an IT Innovation and Exploitation group and manages a portfolio of projects which aims to keep BA on the leading edge of product development. He also leads a stream in BA's Employee Self-Service (ESS) programme, which is establishing flexible and mobile working practices for BA's staff. Fergus reports to Paul Coby, BA's CIO. In a previous role he worked in BA Marketing and headed up the new channels group in eBA, BA's 'internal spinoff' e-commerce unit, and was responsible for mobile and interactive TV developments.

Fergus has a PhD in Electronic Engineering from Queen's University Belfast, Northern Ireland.

Barbara Dalibard

EXECUTIVE VICE PRESIDENT,
ENTERPRISE COMMUNICATION SERVICES,
FRANCE TELECOM, FRANCE

Since April 2004, Barbara Dalibard has been the Executive Vice President of the Enterprise Communication Services (ECS) Division responsible for developing communication services for companies both in France and worldwide, as well as the sale of its services for SMEs, major firms, and multinational corporations in France and internationally.

Barbara Dalibard launched her career in 1982 with France Telecom, where she has held a series of management positions in sales and marketing, dealing in particular with the enterprise and corporate client market.

In 1998, Ms. Dalibard joined Alcanet International S.A.S., a subsidiary of the Alcatel Group, as Chairman, coming to Alcatel CIT in 1999 as commercial director for new operators, before becoming sales director for France. Ms. Dalibard returned to France Telecom S.A. in early 2001 to become Director of Business Markets for Orange France and Vice President of Orange Business. In January 2003, Barbara Dalibard joined the managerial team of France Telecom as Executive Vice President of the Corporate Solutions Division, catering to the needs of major firms in France and around the world.

Barbara Dalibard, a 44 year-old married mother of three, is a graduate of the Ecole normale supérieure, holds a teaching certificate in mathematics and a diploma from the Ecole nationale supérieure des télécommunications.

Alan Harper

GROUP STRATEGY DIRECTOR,
VODAFONE GROUP PLC,
UNITED KINGDOM

Alan was appointed to the position of Group Strategy Director, Vodafone Group on 1 July 2000. He is a member of the Executive Committee of Vodafone Group, responsible for overall strategy, business integration, and for the Group Public Policy activities. He is also a member of the Investment Board of Vodafone Ventures, a member of Vodafone D2 GmbH Supervisory Board, and has been a Trustee of the Vodafone UK Foundation since July 2002 and was appointed Chairman of the Trustees in March 2004. He is also a Board member and leads the Strategy Committee of the GSM Association.

Prior to taking up his current post, Alan was Managing Director of Vodafone Ltd., the UK network operator. He was also Chairman of Vodafone Paging and Vodafone Value Added & Data Services.

Before joining Vodafone, Alan was Strategy Director of Unitel PCN (which became One2One and subsequently T-Mobile UK) from its creation in 1989 until 1995. Before this he held a variety of marketing and business development positions with BBC Enterprises, Infotec, Mercury Communications and STC Telecommunications.

Baldur Johnsen

DIRECTOR OF INFORMATION TECHNOLOGY,
LANDSPITALI UNIVERSITY HOSPITAL,
ICELAND

Baldur Johnsen has over 20 years of information technology experience including systems development, network implementation, IT operations, and computer systems marketing and sales. During the past ten years he has managed IT hospital operations, first as head of IT for Reykjavik Hospital and later as Director of IT for Landspitali University Hospital after the merger of Reykjavik Hospital and the National University Hospital in 2000.

He is on the Icelandic Healthcare Data Network project board, represents the Landspitali University Hospital on the Healthcare Informatics master's Programme governing board at the University of Iceland and serves on the board of the Icelandic Society for Information Processing. He is a member of the Healthcare Information and Management Systems Society, the College of Healthcare Information and Management Executives and the Association of Computing Machinery.

Baldur holds a BS degree in Computer Science and a master's degree in Business Administration from the University of Iceland. Before his involvement in healthcare he held positions in IBM and Digital Equipment in Iceland and was responsible for the development of one of the first ISP businesses in the country.

Len J. Lauer

PRESIDENT AND CHIEF OPERATING OFFICER,
SPRINT CORPORATION,
USA

Len J. Lauer is president and chief operating officer of Sprint Corporation, a position he assumed in September 2003. In this role, Lauer directs Sprint's operations which produce an extensive range of innovative communication products and services, consisting of three primary divisions: Sprint Consumer Solutions (SCS), Sprint Business Solutions (SBS) and Sprint Local Telephone Division (LTD), as well as the Network and IT organizations.

Lauer previously served as president of Sprint PCS since September 2002, leading the sales, marketing, and customer care operations for the nation's first and largest, all-digital, all-PCS nationwide, personal communications services (PCS) network.

Before coming to Sprint, Lauer spent more than five years with Bell Atlantic Corporation. During his last three years with the company, he served as President and CEO of Bell Atlantic-New Jersey. Prior to 1992, Lauer spent 13 years with IBM holding a variety of management positions in marketing and sales.

Lauer holds a Bachelor of Science degree in managerial economics from the University of California-San Diego. He is a board member of the National Organization on Disability (NOD), VeriSign, Inc., and a member of the Business Council Steering Committee of the Nelson-Atkins Museum of Art.

Larry Levine

CIO AND ASSOCIATE PROVOST FOR INFORMATION TECHNOLOGY,
DARTMOUTH COLLEGE,
USA

Focusing on research methodology and statistics, Larry Levine earned his doctorate from Indiana University (IU), Bloomington and received his undergraduate degree from SUNY Stony Brook. In 1984, after serving as a programmer, research consultant, and manager at IU's Computing Services, Levine became director of social science computing at Dartmouth College. He later directed academic computing before advancing in 1991 to his current position where he oversees an enterprise-wide IT environment, including academic, administrative and network IT functions. His focus as director has been on the use of computing in teaching and research, the overall digital infrastructure, and administrative information systems. He has emphasised a leading IT environment aligned with supporting and enabling the institution's priorities. Active in a number of higher education IT professional organisations, Larry is also chair of the board of Valley Net, a major non-profit community ISP in the Dartmouth region.

Geert Linnebank

EDITOR-IN-CHIEF,
REUTERS,
UNITED KINGDOM

Geert became Editor-in-Chief in 2000 having held various editorial management roles. In 2003, he also assumed responsibility for Reuters' data collection, production and acquisition activities. Geert is a trustee of the Reuters Foundation and a non-executive director of Factiva, the business information company jointly owned by Reuters and Dow Jones & Co, Inc. Before he joined Reuters in 1983 Geert was a correspondent for AP-Dow Jones in Brussels, reporting on Belgium and the European Community.

Gino P. Menchini

COMMISSIONER,
DEPARTMENT OF INFORMATION TECHNOLOGY AND TELECOMMUNICATIONS,
CITY OF NEW YORK, USA

Gino P. Menchini was appointed Commissioner of the Department of Information Technology and Telecommunications of the City of New York in December 2001. No stranger to city government, Commissioner Menchini has been serving the city for 20 years, beginning his civic career at the then Board of Education as Special Assistant to the Chancellor. During his 14 years at the Board of Education, he served as the Executive Director of the Management Information Services Division. He also served as Project Director for the Automate the Schools (ATS) project, which created local area networks in 1,100 schools.

After leaving the Board of Education, Commissioner Menchini served as the Director of Citywide Information Technology for the Mayor's Office of Operations. In 1997 he moved into the academic arena to become the Vice President of Information Technology at St Francis College in Brooklyn, where he modernised the college's technical infrastructure and established a bachelor's degree programme for Information Technology. Before joining the Bloomberg Administration, Commissioner Menchini was an Account Manager for Cisco Systems, Inc. Commissioner Menchini serves on the board of the Brooklyn Public Library and is a graduate of Pace University.

Andy Mulholland

GLOBAL CHIEF TECHNOLOGY OFFICER,
CAPGEMINI,
FRANCE

Andy Mulholland joined Capgemini in 1996 after 13 years in senior IT roles. An early pioneer in PC/network technology, his focus on information technology, as opposed to traditional computing, brought him international recognition for Internet-based technology. He has published five white papers in the past six years, proposed technology architectural models, three of which have become the norm throughout the technology industry, including the concept of 'adaptive IT'. His role of Global Chief Technology Officer includes advising the Capgemini Group management board on all aspects of technology-driven market changes. He serves on the technology advisory boards of several organisations, including Cal IT (the Californian State Technology Board), and has been, or is, a director of various industry boards including the Open Mobile Alliance and the MIT Supply Chain Group.

Andy's expertise in the alignment of IT technology to serve business objectives is of great value in defining Web services and IT governance models, two areas requiring hybrid business and technology understanding. He has been the founder, or co-founder, of four technology companies that have either been acquired by leading multinational technology companies or gone public on the NASDAQ market.

Agnes Nardi

MANAGING DIRECTOR,
HUTCHISON TELECOMMUNICATIONS (HONG KONG) LTD,
HONG KONG

Agnes Nardi, as Managing Director of Hutchison Telecommunications (Hong Kong) Limited ('Hutchison Telecom'), oversees Hutchison Telecommunications International Limited's (HTIL) wireless communications businesses in Hong Kong, Macau and Mainland China. HTIL is a subsidiary of Hutchison Whampoa Limited.

Hutchison Telecom is the largest mobile operator in Hong Kong, currently providing 1.9 million subscribers with advanced 3G video mobile communication services, superior GSM Dualband and CDMA services. These three mobile networks – 3G, GSM Dualband and CDMA – were consolidated under the '3' brand name in May 2004. Ms Nardi was appointed as Managing Director of Hutchison Telecom in April 2000. Under her leadership, Hutchison Telecom spearheaded Hong Kong's 3G development and launched the territory's first 3G services in January 2004 as an integral part of Hutchison Whampoa Limited's global 3G footprint. Ms Nardi also expanded the company's mobile business into Macau in August 2001. By providing superior and innovative GSM dualband services, the Company has already become the second largest operator with a remarkable market share of 35 per cent in Macau.

Ms Nardi holds a bachelor's degree in Social Sciences from the University of Hong Kong.

Brad Noblet

DIRECTOR OF COMPUTING TECHNICAL SERVICES,
DARTMOUTH COLLEGE,
USA

Brad Noblet, a veteran computer industry manager, is Dartmouth College's Director of Computing Technical Services, with responsibility for Dartmouth's data, telephone and cable TV networks, central machine room operations and software development. His deep experience in operations management and product development/research make him uniquely qualified to advance Dartmouth's network and central technical services.

A 1982 graduate of Indiana University at Bloomington in Computer Science, Brad was that school's Manager of Data Communications, with responsibility for the institution's statewide data network. He then left for private industry, working in product development and management for a number of hardware manufacturers including Codex Corp., Ungermann-Bass, Tandem Computers and the Wellfleet Communications division of Bay Networks. At Ungermann-Bass, Brad served as Director of Engineering and General Manager creating and overseeing the development of AccessOne, the world's first smart hub. He joined the Wellfleet Division of Bay Networks in 1995 to manage its Router products – delivering over $600 million in annual revenue. Since leaving Bay Networks in 1998, Brad has been involved in a number of start-up ventures focused on the converged voice, data and wireless sectors.

Mal Postings

GLOBAL LEAD FOR MOBILITY AND RFID SOLUTIONS,
CAPGEMINI,
FRANCE

Mal Postings joined the Capgemini Group in 1998, serving as leader for Electronic Commerce and Internet solutions for Capgemini in the UK. In 1999, he transferred into a global role leading the Customer Relationship Management team for Group Financial Services and Insurance. In 2000 he was part of a small team that initiated and developed Capgemini's global strategic partnership programme with specific responsibility for managing the relationship with Sun Microsystems, which grew to a service business of over €1.5bn during the three-year period in charge. As global lead for mobility enterprise solutions, he conceived the group's strategy, points of view and offer portfolio which is sector and region aligned, growing this to over 200 successful references. He has since taken on the role of Global RFID Lead.

He started his career in 1978 as an actuarial student within Axa Insurance, held several IT posts covering application and systems design, leading a new object-oriented design wave and forming the initial consolidated customer database/warehouse systems across many legacy systems. He then transferred back into a business/marketing role leading the company's Savings and Investment product portfolio. After an Executive MBA from Lancaster Management School, Mal resumed a role as a lead person within Axa's strategy department.

Howard Rheingold

AUTHOR,
USA

Howard Rheingold is a participant-observer in the design of new technologies, a pioneer, critic and forecaster of technology's impacts, and a speaker who involves his audience in an adventure in group futurism. He is a teacher at a course at Stanford University called A Literacy of Cooperation, and is part of a long term investigation of cooperation and collective action that is undertaken in partnership with the Institute for the Future.

He is best known as an author and in 2002 his book, Smart Mobs, was widely acclaimed as a prescient forecast of the always-on era. His books Virtual Reality and The Virtual Community are published in French, German, Italian, Spanish, and Japanese language editions, in addition to distribution in the United Kingdom, and the United States.

Since the late 1990s, Howard Rheingold has cat-herded Rheingold Associates, a consultancy for virtual community building.

Rheingold was the founding Executive Editor of HotWired, the pioneering online publication launched on the World Wide Web by Wired magazine. He was the founder of Electric Minds, named by Time Magazine one of the ten best websites of 1996.

Arun Sarin

CHIEF EXECUTIVE OFFICER,
VODAFONE GROUP PLC,
UNITED KINGDOM

Arun started his career as a management consultant before moving in 1984 to Pacific Telesis Group in San Francisco. He was appointed CFO and Chief Strategy Officer at Pacific Bell, before becoming Vice President and General Manager, San Francisco Bay Area Telephone Company. Following the demerger from Pacific Telesis of the mobile and paging businesses to form AirTouch Communications, he was appointed Senior Vice President Corporate Strategy and Development. On becoming President and CEO, AirTouch International, Arun was responsible for the acquisition of wireless licences in several overseas territories. He then became President and CEO of AirTouch Communications. Within the combined business, Vodafone AirTouch Plc, he was CEO US/Asia Pacific region, and also headed the Global Technology division, responsible for the introduction of wireless Internet services.

In 2000 Arun became CEO of Infospace, while maintaining a non-executive directorship of Vodafone AirTouch Plc. In 2001 he joined Accel-KKR Telecom, where he oversaw the acquisition of Bell Canada's Yellow Pages business. Arun assumed the post of CEO, Vodafone Group Plc in 2003.

Arun has a BS in Engineering from the Indian Institute of Technology and an MS in Engineering and an MBA from the University of California at Berkeley.

Mauro Sentinelli

DEPUTY CHAIRMAN, GSM ASSOCIATION,
AND FORMERLY MANAGING DIRECTOR, TELECOM ITALIA MOBILE S.P.A. (TIM),
ITALY

Mauro Sentinelli joined SIP (currently Telecom Italia) in 1974. In 1983 he became a member of the Global System for Mobile Communication (GSM). In 1991 he became Director of Marketing and Planning in the Mobile Division of SIP (Telecom Italia). In 1994 he was appointed Deputy Managing Director of Telecom Italia's Mobile Division. In 1996 he designed and launched the prepaid 'TIMCard' service, for which he received the Outstanding Marketing Award from the GSM MoU Association. In 1997 he left TIM but returned in July 1999 as Managing Director. In November 1999 he designed and launched UNI.TIM Universal Number and the AutoRicarica tariff (customers receive a bonus for the incoming traffic). In January 2000 he received the 'Man of the Year 1999 Marketing Award'. In May 2000 he launched i-TIM, interactive services. In February 2002 he received the 'Roll of Honour for Lifetime Achievement Award' from the GSM Association. In April 2002 he was appointed a member of TIM's board of directors.

In February 2003 he was appointed Deputy Chairman of the GSM Association.

Shreekant (Ticky) Thakkar
DIRECTOR OF MOBILE TECHNOLOGY,
MOBILE PLATFORMS GROUP,
INTEL, USA

Dr Shreekant Thakkar plays the CTO role in Intel's Mobile Platforms Group (MPG). He has over 26 years of experience at Intel and Sequent (now part of IBM). He was a key driver in establishing direction for mobile notebook PCs to transition from portable to wireless computing with Intel's Centrino Mobile Technology. Recently, he drove the convergence of computing, communications and entertainment in MPG's Florence Concept Platform. He also created the Mobile Platform Architecture team within MPG. Prior to MPG, he was the general manager of a new business unit, Persona, which delivered smart proactive services over wired and wireless devices. At Intel he also led the teams that developed the Pentium_ Pro MP (Xeon) and Multimedia/Graphics Media (SSE) extensions to the Pentium_ III and IV. He succeeded in bringing the Pentium_ Pro MP (Xeon) processor to market in record time, 11 months from first silicon to production. He has led the development of security functionality in Intel's processors and chipsets and held a roadmap-planning role for Intel's microprocessor family.

He holds a PhD and MS from the University of Manchester and BS from the University of London. He holds or has pending applications for over 50 patents.

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