

THOUGHT LEADERSHIP FORUM

WORKING WIRELESS: HORIZON 2013

Planning today for long-term success

September 9, 2003

000 FIRST TUESDAY ZÜRICH

GDI for economic and social studies



Results and Findings

Think Tank > Panel & Discussion > White Paper

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Presenting Partners:



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Foreword

■ Foreword

The Thought Leadership Forum is more than just a conference. It is a learning process, which includes preliminary research, a structured software - supported brainstorming session bringing together a relatively small but diverse group of Thought Leaders, an evening presentation and discussions with a larger audience and finally the publication of the key findings in a White Paper.

■ The Question

Always-on, always-connected business means perpetually balancing immediate and unabridged information flow with long term, complex decision making. With the universe of mobile-phone users expected to pass the 1bn mark in 2002, the mobile telecommunications market continues to grow. The convergence of devices, applications and services creates an unprecedented pressure on business to smartly apply wireless technology to gain a competitive edge, while at the same time making life easier for employees and customers and guaranteeing their privacy. Working Wireless, however, means going beyond phones to applications, services and wireless strategies that extend the reach of today's enterprise to tomorrow's virtual networked economy.

Beyond rapidly evolving devices and user friendly interfaces, the big change will occur in the way we look at the full business process and flexible work and life models that will create new, more profitable ways to build the company of the future. Living and working in a fully integrated and mobile information society is in the works. Building sustainable business today demands a vision of what lies ahead. Where do you stand? Is your organization ready to join this debate?

■ The Format

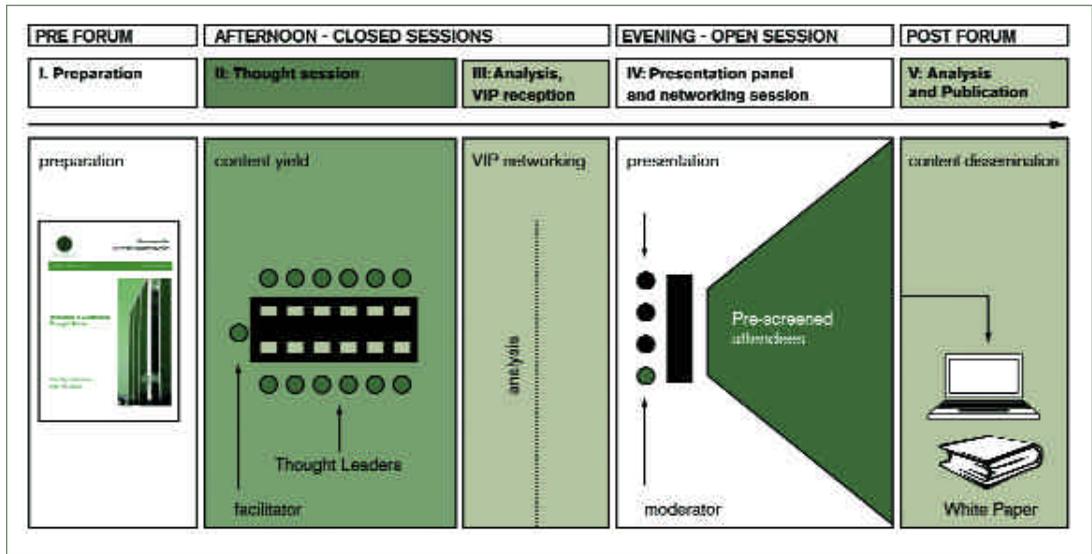
Prior to the Thought Leadership Forum, a Thought Starter report providing background information on the topic is commissioned and distributed to the participants.

The Forum begins with a structured brainstorming and scenario planning session bringing together Thought Leaders focusing on the topic during the day. The Thought Leaders are decision-makers from various sectors, backgrounds and with differing perspectives who are gathered to accelerate the development of new and meaningful insights and ideas.

Immediately following the Forum, the results are analysed and presented and discussed with a larger evening audience.

A second round of analyses, including the evening discussion and their feedback, is completed and the results are published in a White Paper.

Foreword



The Results

Included in the results from the Forum are the following papers:

Interviews: A few Thought Leaders express their personal view on the topic.

Thought Starter: The purpose of this paper is to provide background research about the topic and current trends. It is commissioned by First Tuesday Zurich and the GDI, and written by Evalueserve.

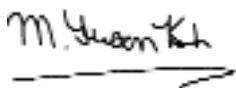
White Paper: This paper is the key analysis of the results of the think tank and scenario planning among the Thought Leaders and includes as well the input of the evening VIP audience.

Keynote: Transcript of the keynote address from Greg Garrison, Director Technology Team, Menlo Park Europe (UK), PricewaterhouseCoopers.

Thanks

A very special thanks to our Presenting Partners, Ericsson and Swisscom Mobile, our Knowledge Partner PricewaterhouseCoopers and our Forum Partners IBM and Microsoft. Many thanks as well to our Software Partner groupVision and our Media Partners Financial Times and Netzwoche.

We would like to extend our thanks to the Thought Leaders and interviewees for their time and commitment. A very special thanks to our partner and the host of the Thought Leadership Forum, the Gottlieb Duttweiler Institute. Our appreciation also to the "Wireless Foresight" Team from The Royal Institute of Technology Stockholm and from the Stockholm School of Economics, Sweden and to Evalueserve for their contribution to the research and insight which formed the foundation of this White Paper.



Susan Kish
First Tuesday Zurich



Karin Hartmann
Gottlieb Duttweiler Institute

Thought Leaders – Interviews

Wireless Focus: Eduard Bähler, Swisscom Mobile



Leading Swisscom's efforts in the Residential and Small Business market, Eduard Bähler deals with a market of more than 3 million users. A graduate of ETH-Zürich's engineering department and St. Gallen's MBA program, Bähler joined Swisscom in 1998, and has since then been active in client marketing, a key aspect of the company's continuing growth.

It seems pretty clear how wireless working is affecting corporations, because they can invest heavily to outfit people with devices and built virtual private networks. But smaller companies have different budgets and organizational needs. What do you see happening in that space?

In the small-business area the device with which they access various services is the most important thing. And although we now have all sorts of smart phones and PDAs, the device of choice is the laptop, especially because they keep getting smaller and less expensive. Throughout the business market, email is still the favorite application; so users need the high-processing power and the large screen and a decent keyboard, because using email means not just handling messages as such but also reading and working on the attachments that come with them.

The next thing users need is access to their emails. Smaller companies typically work with independent service providers like Bluewin rather than having their own dedicated mail servers, so they need accessibility to the ISPs. For the small businesses we have two propositions: GPRS and wireless LANs, which we are pushing very hard in Switzerland and also on the European scale.

A large proportion of Swisscom's mobile customers often work abroad, so we want to have WiFi hotspots all over Europe. Swisscom's new Eurospot programs—which has around 1,300 proprietary hotspots—allows these business travelers to have wireless broadband access in France, Italy, the UK, Germany, the Netherlands, Belgium, Luxembourg and Spain. Plus, we have about 850 additional hotspots you can use via roaming agreements. It's very easy to use: you enter your mobile number, get an SMS with the access password and are charged for it on your monthly bill.

One of the big issues from the Thought Leadership Forum was whether companies should "push" services to their clients. What is your strategy?

We have very close contact to large corporations through direct sales, which are great for gathering information. But we also have frequent "customer roundtables," which are focus groups with target markets such as small businesses, high-ARPU (average-revenue-per-user people) and low-ARPU people to discover their needs. And we also do a lot of market research using anonymous data to track issues in a quantitative way.

Doing such research, we sometimes found that sometimes new developments remain astonishingly unknown to the general public. For example, wireless connectivity is a given for those in the industry; yet most of our customers do not use it in a daily manner. On the other side, we underestimated how minor usability problems can stop people entirely. For example, we just launched a quite simple wireless-internet package with a PCMCIA card, but when you plug the card into the PC you get a "severe error" message from Windows. Now, people in IT just ignore the message and keep going, but the average user will stop for fear of corrupting their PC. So on the small-business side, if you cannot get them past that first barrier, you will never get usage. On the corporate side, the issues are costs and security. They want systems which are easy to administer.

Thought Leaders – Interviews

For all our business users we are trying now to push the coexistence of three technologies: GPRS, UMTS and Wireless LANs. Our aim is to give users seamless connectivity, meaning that once you are connected you have constant access without worrying about the passwords and network connections. Apart from building the technology for these seamless nets, we also need to create pricing strategies that will stimulate usage and attract people. Today, GRPS and UMTS are charged based on data transfer, whereas Wireless LANs are charged by the minute; but it could just as easily be reversed. We have to look closely at usage patterns and then price in ways that target specific groups. For instance, we are thinking of using flat-rate elements, but not pure flat rates. We have seen in the United States that flat rates drive traffic but do not raise revenues since it demands more investments in the network.

In the broader wireless space, which visions of the future do you think will not be fulfilled?

The future will not be that different from today. Most of the big players will survive, the devices will not become irrelevant, access will not be totally commoditized. But the relationships between the big players will change. I doubt Nokia will stay as strong as it is today. In Japan, for instance, you have the operators dominating and no handset brands. And the future will lie somewhere between these two models.

A valuable service will always cost something, but people will re-assess what is actually valuable. Look at cars, which are a mature industry: no one will pay three times as much for a Mercedes as a BMW. Today, in telecom there is an imbalance between what people pay for voice communication and for data communication. But when Voice Over IP becomes a reality, the price premium on voice will disappear.

Now the opposite question: Which factors do you think are being underestimated in terms of their effect?

I believe fundamentally in the human need to communicate. If you look only ten years back and you see the dramatic effect that mobile voice communications had, it has been amazing. And that is not just in one country, it is worldwide. I remember when penetration reached 50 percent, we all said, "That's great, but next year things will slow down." And instead it just keeps going through the roof.

Data communication will be the same. The only question is how fast it happens. In ten years we will send around videos, virtual-reality environments, and so forth. There is no saturation point for person-to-person communications because we always find new things to share.

Thought Leaders – Interviews



Wireless Focus: Dr. Heinz Gutscher, University of Zurich

As head of the University of Zurich's Social Psychology Group, Dr. Heinz Gutscher focuses upon issues related to how societal interactions develop and transform. Reflecting the importance of technology as a force in driving those changes, Gutscher also chairs the scientific committee of the Swiss Research Foundation on Mobile Communication.

You referred during the forum to "social overheating." Can you explain the concept?

Social overheating means having too many contacts, being committed to too many people at the same time. I just invented the term today, when I heard people at the Forum talking about radar devices that let you contact strangers on the street. I don't want to be beamed at all the time. To have the possibility can be quite exciting in certain periods of your life, for example when you are young and trying to constantly meet people.

But if your workload is high, then it will become a status symbol to not be available. One new philosophy toward work could involve a very changing rhythm - sometimes super-active, with 16-hour days, and sometimes just working an hour or two. And that means also changing your personal use of wireless technologies, so that sometimes you're available and sometimes not.

There is a history of backlashes against technology. What form do you think a backlash against wirelessness might take?

I think some of the public will be very selective with the technology they use and when they use it. We will see a lot of people taking time out to enjoy "wirelessness." You could even have a national park without any mobile coverage - a low-tech, slow-moving area with no wireless access, ideally suited for timeouts.

Okay, to be realistic that probably will not happen in the very near future. But while the industry will try to sell everything that is possible, as much as possible, consumers will be much more selective. People are fed up with new gadgets and changing standards. Why should they rush in to buy a new product when it could become obsolete in short time? The migration costs from one to another technology are too high.

Which parts of the wireless future do you think is not going to match the current predictions?

I think technologies will, for example, revolutionize stores because they will automate processes like maintaining inventory, but I am less sure about the home side. For example, I might like to have my refrigerator ordering basics like milk and eggs, but with items like wine and meat and vegetables I would rather see what I am buying in person and know the people I am buying from. For many people, that sort of shopping is something they enjoy doing in their spare time. So I think we could see a revival of classic markets, something parallel to the Slow Food movement in Italy and elsewhere.

Virtual closeness through means of new wireless technologies will be important; the potential of the desperately sought killer applications could evolve from this field. But users will also find out that the illusion of closeness - as perfect as it can be - can be a painful experience, because the closeness remains an illusion and the interaction with others will remain limited.

Thought Leaders – Interviews

Do you think the wireless industry overestimates the public's desire for the newest thing?
Young people who have not invested a lot of time and learning into old technology can switch easily. But I have several megabytes in my old Psion and I am not going to move that information many more times between platforms. Sure, if there is a huge added value consumers will switch. A lot depends upon the reliability and usability of the technology. People don't want to fuss around. And cost is also important.

It seems to be accepted as fact that working wirelessly makes people more efficient. Do you think that has proven true?

I don't know. If you look at it from the standpoint of the boss, yes, because people are working more hours - at home and while traveling. But I doubt people are much more efficient, with the exception of people who already now work in a very mobile way. We are doing many of the same things we did 15 years ago on an old Macintosh - writing words, analyzing numerical data and doing presentations. I don't need a 3 gigahertz machine to do this kind of work.

Wireless access will be a beautiful thing in my domain, because libraries will become even less important now that most of the important journals are available electronically. But I am very critical toward the idea that we are "revolutionizing knowledge." Because information is not the same as knowledge. Yes, we have information at our disposal all the time, wirelessly, but we still have to integrate it in our heads. Knowledge involves taking decisions by assessing various aspects of a problem and that takes real time in your brain.

Also, there are limits to how much you can work wirelessly. You cannot really work on a bus because it is too crowded, and you cannot work in a park because the display is not readable enough, at least for the time being. Maybe you will answer emails, but you cannot really do something intensive unless you are extremely focused. We have heard that in the future we will need fewer offices. That is perhaps not true. We will need a slightly smaller number of them, and we can use them in a more flexible way - although maybe with the ensuing problems of lessened identification with and loyalty to the workplace.

In the end you cannot really do all your meetings wirelessly, because there is just no substitute for being face-to-face. Unless you know your colleagues really well, you have to see the people, you have to smell the people, you almost have to touch them, to establish the emotion of trust. No matter how high the screen resolution, you can't shake hands with someone wirelessly.

Thought Leaders – Interviews



Wireless Focus: Henrik Pålsson, Ericsson

As the head of Ericsson's Consumer and Enterprise Lab in Lund, Sweden, Henrik Pålsson is focused upon understanding the ever-evolving demands from consumers and companies. His group works globally, interviewing people and generally "living close to market." Ericsson's Vice President for Consumer Insight, he has worked in the mobile realm since 1987, extending his experience beyond the devices to also include cultural, cognitive and commercial aspects of the wireless evolution.

When you look at wireless working, it seems pretty clear where technology will go. But what are the human factors that will be critical?

Wireless development combined with the internet is shaping a different social structure in the workplace. In order to empower their organizations, companies and managers need to think in much less hierarchical, much more interactive, ways. They must give their employees the instruments and autonomy to make a lot of decisions on the fly. Directives and very strict instructions do not apply. Instead, the employee needs to understand the core of the business, its strategy and tactics, and then act based upon that. So the capacity for wireless working makes a flattened hierarchy possible, but that capacity also makes it necessary.

Looking around the world, what are the differences you see in terms of working wirelessly?

There are very different heritages that shape development. The internet was born in America, so the natural tendency there is to expand the internet through making it wireless. In Europe we have a different background; because we also had the GSM infrastructure, people think more about that sort of service than they would in America. In Asia it was not until recently that fixed-net and broadband internet access arrived to the wider market; so you have another context, which is that people went straight to the mobile.

In the United States the focus is on "freedom for the user" and the idea that there should not be closed-off "secret gardens." But in Japan they focused on simple, convenient and more packaged services, which works better for a mass market. Now, we are doing that gradually in Europe, too, trying to learn from Asia. Because we have realized that even for the early adopters, total freedom is not the optimal choice since they also lack time. A very small proportion of early adopters, less than quarter, are technology freaks. So even the early adopters don't want to constantly configure laptops and handsets. They want easy-to-use packaged services, more similar to what is happening in Japan than in the United States.

Interfaces and usability are a huge "human factor" with wirelessness. Fifteen years from now, how do you think people will be interacting with their devices?

A lot of the decisions in this industry are taken by highly educated people creating solutions for other highly educated people, which often leads to highly complex interfaces. But in most organizations there are ten cell phones for every laptop, which means we need to think about all those other people. In the future the interfaces will have to be much more natural, using all the senses that we are given, rather than users having to adapt to the technology.

There is a large interest, particularly among women, in being able to interface with devices using things like their voice. But we have to be careful when it comes to interfaces such as voice recognition - the industry will need good timing, because often we introduce things too early. WAP was an interesting example; what started as an internal discussion in the industry

Thought Leaders – Interviews

created a lot of mass-market interest and expectation, but then the technology and the standardization was not ready to meet that demand. So there was a big gap between what is possible in the early phases and what was expected by consumers, leaving people frustrated.

For which wireless developments do you think people are underestimating the potential influence?

Voice communication is still the most common way to communicate in the whole world, for educated people and for non-educated people. We have done a lot with it, but I think we can do a lot more, not only with user interfaces but with services connected to voice. The majority of telephony today is still on fixed nets, not just because of price but also because of the quality of voice and the reliability of the network. Fixing those basic issues will have a bigger impact in the foreseeable future than anything like games and other fun applications.

Thought Leaders

Name	Company Name & Title
Eduard Bähler	Swisscom Mobile, Head of Residentials and Small Business
Sonja Bietenhard	Forum Mobil, Managing Director
Chris Bray	IBM, Wireless e-business Executive
Mahmoud Dasser	Cisco Systems, Business Development Dir. For Worldwide Mobile Services
Peter Fischer	Fed. Office for Communications (BAKOM), Deputy General Director
Elgar Fleisch	University of St. Gallen, Institute of Technology Management, Professor
Hanneke C. Frese	Zurich Financial Services, Head of Group Capabilities
Heinz Gutscher	University of Zurich, Institute of Psychology, Professor / Head of Social Psychology Group
Oliver Haeggberg	Independent Executive Advisor
Volker Jantzen	SVOX AG, CEO
Rajinder Jhol	solvelT.ch, Founder
Bo Karlson	Royal Institute of Technology (KTH), Director External Relations and General Manager Wireless@KTH
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Jan Reinhart	DoOnGo, VP Marketing
Gert Rieder	TDC Switzerland AG, COO Mobile
Thomas Rupp	Microsoft Switzerland, Manager Communication Sector
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Facilitator:	
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Keynote:	
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Business Information – Market Overview 09/09/03 – Research Expert

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Working Wireless: Horizon 2013 - Planning today for long-term success

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EXECUTIVE SUMMARY

The potential for strong returns on wireless investments by lowering operating costs and enhancing productivity has generated considerable amounts of interest among enterprises worldwide. Focused on solid opportunities within the enterprise, these initiatives are no longer solely dependent on technological breakthroughs.

Numerous opportunities to apply wireless solutions across the enterprise exist today. These include initiatives that will involve both employees and customers. Further, several promising wireless opportunities for enterprises are emerging in the areas of sales force automation, field services, supply chain management, product development etc.

Wireless applications have strong potential wherever the employees are physically far apart and need to work in close coordination with each other. Mobile enterprise solutions enable companies to unlock the real value of wireless by delivering just the right information to just the right people at just the right time. Wireless applications enable better decision-making, increased productivity and greater employee empowerment as well as shorter response and process cycle times. Thus, leveraging wireless technologies, enterprises are able to offer more value added products and services.

Some long-term intangible benefits arising by deploying wireless technology solutions in enterprise space are positive customer perception and increased employee job satisfaction. A few of the technologies that are expected to shape the future of enterprise working are Bluetooth Wireless Technologies, 802.11b WLAN, M2M Solutions, RFID tags etc.

However, there are several barriers that hinder the adoption of these wireless technologies by enterprises. Immature network infrastructure, Security, Return on Investments, Quality of Service and Integration of various technologies are a few of the concerns that need to be addressed before successful wide-spread implementations of wireless technologies take place.

Enterprises worldwide are aiming towards becoming real-time enterprises (RTE). An RTE competes by using the most up-to-date information to effectively and efficiently execute critical business processes.

There are two possible scenarios that are expected to emerge in future. They are:

01. Widespread adoption of wireless technologies by enterprises worldwide with an emergence of fully integrated complete end-to end wireless mobility solutions
02. Fragmented technology market with medium adoption of wireless technology solutions by enterprises

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WORKING WIRELESS: CURRENT SCENARIO

Businesses, globally, are facing an ever-increasing need to be flexible, dynamic and responsive in order to remain competitive and fulfill customer requirements. Hence, the logic for enterprise adoption of wireless technologies in their broadest form, which can deliver tangible business benefits is well recognised.

This chapter analyses the current state of wireless technology in terms of evolution of wireless technologies in recent times and their application in the enterprise space. Further, the trend of growing usage of wireless technology solutions by businesses and enterprises and the perceived value addition by such usage has been examined. Some examples and case studies of such successful deployments and usage have also been provided.

■ CURRENT STATE OF WIRELESS TECHNOLOGY

Evolution of Wireless Technologies in Recent Times

Since the beginning of the 1990s, second generation mobile systems have been widely deployed around the world. Significant improvements have been made in the second generation (2G) mobile systems compared to first generation mobile systems. Network interfaces (IS-41 and GSM-MAP) have been standardized to provide roaming capabilities. In addition to improved voice services, enhanced value added services are being provided. However, 2G systems still suffer from some drawbacks. The data rates are still limited due to limitations of the defined air interface radio technologies. Therefore, services requiring higher data rates such as Internet access and multimedia services cannot be provided. These issues have become key driving factors behind the development of faster network systems that are packet based, unlike the circuit switched 2G networks.

Amongst the most important packet-based network is the General Packet Radio Service (GPRS), referred to as a 2.5G system, as it is based on the existing 2G infrastructure. The 2.5G technologies such as GPRS/EDGE (Enhanced Data Rate for GSM Evolution) are an important first step towards wireless computing. GPRS is compatible with both GSM (popular in Europe and Asia Pacific) and TDMA (prevalent in North America). It is, however, the 3rd Generation Wireless, or 3G mobile communications systems, which will offer substantially enhanced capacity, quality and data rates. 3G is expected to bridge the gap between wireless and the wired world, leading to true experience of convergence computing. Amongst the most dominant 3G standards are the WCDMA (European standard) and CDMA2000 (American Association).

In the short term, the wireless world is expected to have a mix of 2G technologies like GSM, CDMAOne and TDMA along with 2.5G technologies such as GPRS/EDGE. 3G systems such as WCDMA and CDMA2000 have already seen limited deployment in Japan and are expected to take another two to three years for complete worldwide deployment.

An implication of diverse network technologies is the necessity of mobile terminals (PDA/Mobile Phones/Other Smart Devices) that are compatible with all the above-mentioned networks. Vendors like Qualcomm, Nokia, Ericsson, Motorola, etc. have already launched dual/tri-mode terminals that are compatible with both 2G as well as the above-mentioned networks.

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Wireless Technology in Enterprise Space

Enterprises in various industry verticals can utilize wireless data technologies to conduct business in the following two distinct ways:

01. Wireless Enterprise or Business-to-Enterprise (B2E) Opportunities:
These are employee-facing initiatives.
02. Mobile Commerce or Business-to-Consumer (B2C) and Business-to-Business (B2B) Applications:
These are the customer-facing initiatives such as financial services provision.

The value chain of 'mobile access to enterprise data' industry can be represented as shown in the figure below:

Figure 1: Value Chain of 'Mobile Access to Enterprise Data' Industry



Source: commNOW

Equipment Providers: This segment is comprised of companies that provide equipments such as PDA's, Laptops and other handheld mobile devices. This segment also includes companies that provide hardware connectivity equipments.

Enterprise Application & Application Platform Providers: This segment is comprised of companies that provide applications and application platforms that enterprises normally use. Enterprise applications include MS-Office tools, Lotus Notes, Spreadsheets, Databases etc.

Mobile Application & Application Platform Providers: This segment includes companies that provide application development platforms for wireless devices (such as BREW from QUALCOMM and J2ME from Sun Microsystems), mobile application servers (which integrate with existing infrastructure and support enterprises' existing applications, such as M-1 Mobile applications servers from Aligo) and mobile applications (applications that can be accessed or used by mobile devices such as PDAs and wireless handsets).

System Integrators: This segment is comprised of companies that integrate the existing enterprise applications and application platforms with the mobile application platforms to enable 'mobile access to enterprise applications'.

Service Providers: This segment is comprised of service providers that enable secure mobile access to enterprise networks. They include mobile operators, ISPs and IP-VPN providers.

Significant applications of wireless technologies in the enterprise space exist in the following areas:

01. Mobile access to enterprise data: This includes both employee facing initiatives as well as customer facing initiatives
02. Mobile asset management: This includes wireless applications in logistics, commercial telematics and fleet management

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Technology Requirements

Enterprise applications call for challenging requirements such as:

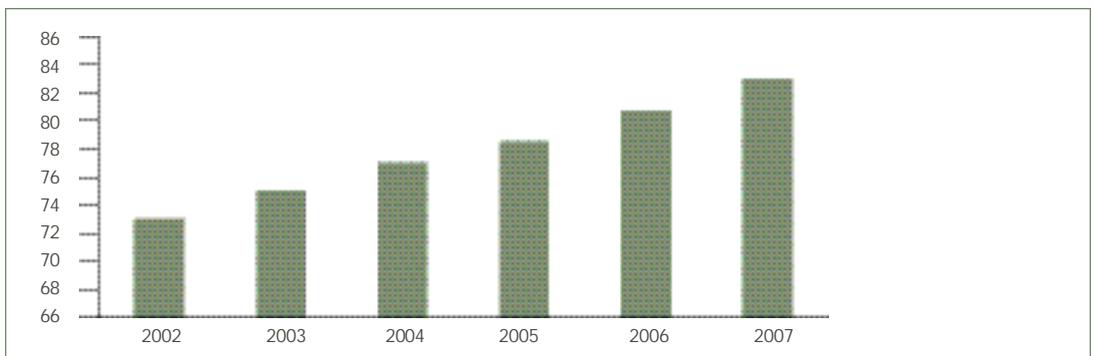
01. Two-way data transfer
02. Implementation of complex business logic
03. Support for multiple users
04. Ability to integrate the wireless element with existing back-end systems
05. Varying levels of security for different executive levels

This report primarily focuses on 'mobile access to enterprise data' solutions. Other significant applications such as logistics management, use of radio identification tags in retail industry etc. have also been covered wherever appropriate.

■ GROWING USAGE OF WIRELESS TECHNOLOGY IN BUSINESS

As per an IDC study (2003), there are approximately 73 million mobile workers using some form of mobile wireless technology solutions in Western Europe. This number is expected to grow to more than 83 million by the end of 2007, which is close to half the total workforce in Western Europe.

Figure 2: Number of Mobile Workers in Europe, 2002-2007 (in millions)



Source: IDC

At the enterprise level, leading companies are deriving real benefits from wireless applications using current technology. Wireless applications are ideally suited to meet some of the most common and familiar operational challenges enterprises face regularly. Primary among them are situations where physical distance between workers makes information flow difficult and situations in which workers need real-time information to respond quickly to unexpected challenges. Further, applications based on the location or status of assets and inventory can produce significant value if they are wireless enabled.

The following areas are expected to significantly benefit from wireless solutions:

01. Sales force automation
02. Field service
03. Supply chain visibility
04. Shipping and logistics
05. Product development
06. Customer interactions
07. Marketing initiatives through innovative interactions
08. Operations monitoring

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Enterprises, particularly in industries such as food and beverage distribution, service and repair, emergency health care services, security services and transportation, have been using wireless data solutions since the early 1980s. A heightened potential for enterprise wireless data solutions has emerged as wireless carriers are upgrading their second-generation digital voice networks to 2.5G and 3G networks with enhanced data capabilities. Additionally, an entire value chain has begun to evolve which utilises these networks and delivers financial benefits.

The major services in the area of mobile access to enterprise data are likely to be:

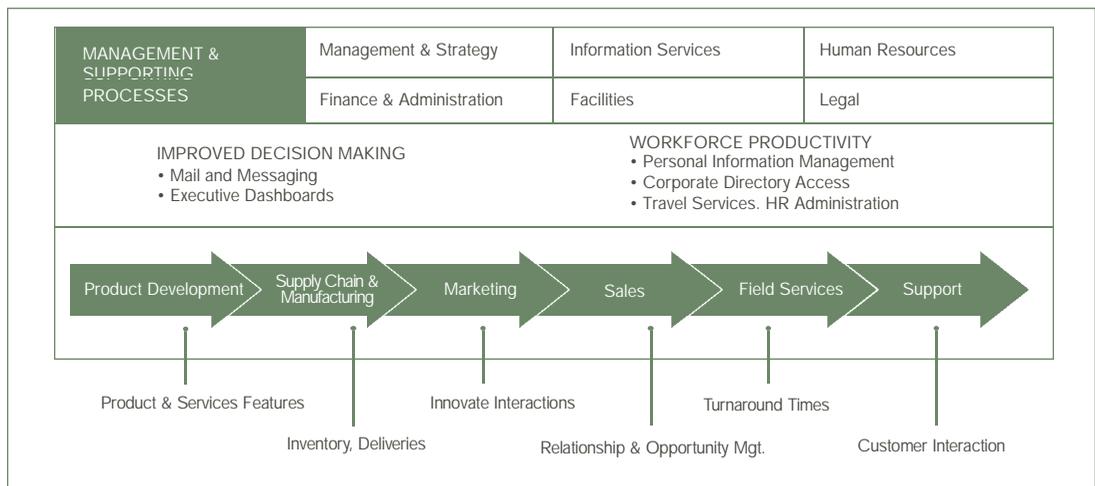
- Voice communication and voice mail
- Email, instant messaging and unified messaging
- Corporate database access and data entry
- Intranet access
- Access to supply chain management information
- Access to CRM applications

We have analysed some examples of successful mobility initiatives taken by enterprises in the case studies provided in the following section.

How is Wireless Technology Adding Value to Business?

There are several advantages associated with a mobile solution implementation. Some advantages are easily measurable, such as saved time, increased productivity and revenue whereas other advantages are more intangible, such as long-term benefits of positive customer perceptions as well as increased job satisfaction among employees whose job functions are made easier.

Figure 3: Mobilizing the Enterprise



Source: KPMG Consulting

Following are a few examples of how mobile solutions are adding value to businesses:

- Mobile access to email enables employees to stay in touch with the management, co-workers and customers. This further helps them in taking quicker and better decisions.
- Mobile solutions allow sales representatives to access customer information before sales call. Usage of mobile devices for storing contracts, forms etc. saves time and reduces cost.
- Deployment of mobile solutions in supply chain system enables accurate and quicker flow of information, which allows better decision-making, lowers cost and reduces cycle time.

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- Mobile financial applications allow organizations to offer services like real-time stock quotes, mobile transactions at any time, etc.
- Mobile solutions allow organizations to add new revenue streams as it enables cross selling of products, adding new sales channels and increasing customer loyalty.
- Mobile solutions allow strategic positioning as organizations get access to latest information on sales and marketing and can respond more quickly to frequent changes that occur in the market place.

Some other benefits of deploying mobile solutions are:

- Increased operational efficiency
- Increased productivity and greater employee empowerment
- More customer satisfaction
- Increased ROI
- Increased application availability
- Increased positive customer and partner perception
- Greater convenience

Mobile solutions are changing existing business models. Wireless technology has emerged as a potent enabler of industry convergence, especially in the case of financial services and telecommunications. For example, mobile payment mechanisms are giving wireless carriers a new dimension to their customer relationship management. Wireless technology has already become critical for the success of many companies. For example, financial services companies need to develop their own mobile payment solutions and integrate them with the existing back-end applications to remain competitive.

Mobile solution implementation has changed the work culture as well. 'Virtual teams' are replacing formal team structures. Enterprises are reengineering their work processes and information flows in unprecedented ways, producing breakthroughs in performance, collaboration and productivity.

■ CASE STUDIES

Case 1: Supply Chain Visibility at Ford

A primary benefit of mobile solutions is their ability to reduce costs while simultaneously enhancing product and service quality.

Ford faced significant delays in its replenishment systems. New model launches, line rebalancing operations, frequent part number changes, etc. had created a sub-optimal supply chain with unused inventory and bottlenecks.

Supply Chain System with Mobile Solution:

'WhereCall', a wireless supply chain visibility solution was used for locating, tracking and managing supply chain resources.

The WhereCall system consists of WhereNet's wireless WhereCall tags, antennas, location processors and software that integrates with Ford's SMART parts replenishment system in all the manufacturing facilities.

When line operators need more parts anywhere along an assembly line, they push a button on the WhereCall tag, which corresponds to a designated part. The tag transmits a signal and alerts material replenishment personnel to deliver more parts to the line operator.

For new vehicle launches and line rebalancing operations, the tags are collected, reassociated with new parts and redistributed to all stations. Changes in part numbers can be made remotely at the database and transmitted wirelessly to all tags on the assembly line.

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The perceived benefits after deploying the wireless solution are:

- Quicker parts replenishment
- Reduced cost
- High speed and flexibility along the assembly line
- Improved productivity
- Efficient inventory system

Case 2: Shipping and Logistics at Armstrong Air Conditioning

Wireless solutions are reshaping shipping and logistics with steady improvements in accuracy and customer satisfaction. They enhance the productivity and reduce costs at the same time.

Armstrong Air Conditioning had a manual shipping system that was both labour intensive and prone to inaccuracy.

Manual Shipping System:

A checker looks over outgoing loads, locates and pulls tickets (each with an 11-digit product code). Tickets are then passed to the shipping clerk who enters information into the computer system and handwrites a bill of lading. The system had various possibilities for error, which added cost to the company and frustration to its employees.

Shipping System with Mobile Solution:

Checkers now use a portable, handheld device that runs custom software to scan the products in each shipment. This information is fed through a high-speed, spread spectrum wireless network to an HP 9000 mainframe system, where the file is accessed and the information is returned back to the handheld device. If the shipment is wrong, the system prompts the device operator in real time and the error can be fixed.

The perceived benefits after deploying the wireless solution are:

- Improved accuracy
- Reduced response time for correcting errors

Case 3: Performance Monitoring at United States Postal Service

Performance monitoring outside the constraints of a hard-wired network is essential for continuous improvement.

The United States Postal Services (USPS) used paper-based tools to process transactions and monitor airline performance while transporting USPS packages. This method took a lot of time to convey information and the quality of service was low.

Performance Monitoring with Mobile Solutions:

USPS chose a Symbol SPT 1730 bar code scanning device based on the 'Palm Computing®' platform for monitoring mail flow. After a problem is discovered, a USPS ramp clerk scans the bar code on the mail receptacle, pulls down menus and picks lists on the device to streamline the data collection process. At the end of each day, the Symbol device in an Ethernet cradle uploads data to the USPS central database via the USPS intranet.

The perceived benefits after deploying the wireless solution are:

- Better services due to efficient and accurate information exchange between the airlines and USPS
- Quicker transaction of reports and tracking of information by managers

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Case 4: Wireless Data Connectivity with Vending Machines

The problem with the established process for soft drink vending machines are the sales loss due to machine downtime and instances of machines running out of stock.

Data Adoption with Mobile Solutions:

There are three approaches to mobile data adoption that an enterprise could consider deploying. First, 'Mobile Access' in which the vending machine transmits data on stock levels and operational status and thus improves the replenishment schedule. Second, 'Mobile Re-invention', which enables process reengineering. The stocking and pricing process are re-designed based on the data within the beverage company.

The perceived benefits after deploying the wireless solution are:

- Machine downtime can be reduced. In case of machine breakdown the communication link not only informs about the problem but also provides relevant background information so that the engineer can come with relevant parts and thereby fix the problem quickly.
- Mobile enabled machines communicate the stock status and the stockist can come with appropriate stock and may fill a greater number of vending machines in one round.
- Mobile link provides frequent updates on the impact of price changes and using this information, pricing process can thus be reengineered thereby improving margins

The third approach, 'Mobile Innovation' can be used to generate new revenue streams by advertising at the vending machine ensuring better promotions and supply management with partners. Since these machines are located at public places, these can be used for both text based advertising as well as media advertising using videos etc. These machines can also be used to sell electronic media products such as music, ring tones and screen-savers.

Case 5: Sales Force Automation at Memorex Telex

Memorex Telex needed a central system that will show consistent information about customers to the sales force at all locations.

m-CRM

Memorex Telex chose "eWare's wireless", web based eCRM solution, which enables two-way data communication over a mobile phone and allows access to all network elements using WAP.

The perceived benefits after deploying the wireless solution are:

- Sales cycle became faster
- More effective client interaction as the system provides latest customer histories, pricing and deal information

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WIRELESS NEEDS AND APPLICATIONS: CURRENT AND FUTURE

This chapter analyzes the current and future needs and requirements in enterprise space and the wireless technologies that are expected to address these requirements optimally. Further, the emerging trends in this space that will determine tomorrow have been analyzed in this chapter.

■ NEEDS OF BUSINESSES

This section analyzes the current as well as expected future needs of enterprises and businesses worldwide.

Current Needs

The primary requirements of an enterprise from any wireless application are:

01. Security
02. Integrated functionality
03. Portability
04. Speed of data download and instant connectivity

The following case of Tesco (a supermarket in UK) discusses how the needs related to security are being addressed by mobile applications based on Radio Frequency (RF) tags. The second section of the case discusses how the concern of privacy impedes the acceptance of RFID tags by the industry.

Case Study: Tesco Tries Out Smart Tagging

01. Addressed Requirements:

In a trial, Tesco fitted package of Gillette Mach3 razorblades with RFID tags.

The electronic radio tags, allow staff members and customers to keep track of the goods in the store. They also prevent shoplifting by tracking the razors. If the product goes through the door without being paid for, an alarm is set off.

Such tags are an improvement on the old-fashioned barcodes because they can be read from a distance as they are wirelessly connected to the readers placed around the store on the shelves and at the checkout point.

In future, readers may also be attached to the distribution lorries and warehouses allowing supermarkets to keep track of the security of entire supply chain in a particular area.

02. Requirements that Need to be Fulfilled:

Privacy Concerns with the use of Radio Frequency Tags: There is a security and privacy concern with the use of Radio Frequency tags due to tags remaining active even after the purchase of the goods has been made. This can enable the supermarkets to keep a track of the product even after sale and hence infringe upon the privacy of the customer. This concern needs to be addressed before such RFID tags are adopted globally.

Expected Future Needs

A critical requirement of enterprises worldwide is to exploit mobility to support real time key processes and to provide workforce with access to critical information. Security concerns and high deployment and integration costs are still decelerating the expected speed of adoption of cutting edge technologies that can enable this optimally.

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The most significant contribution of wireless technologies for enterprises is expected to be in increasing productivity and reducing the turn around time in corporate communications.

The likely future needs of an enterprise will be as follows:

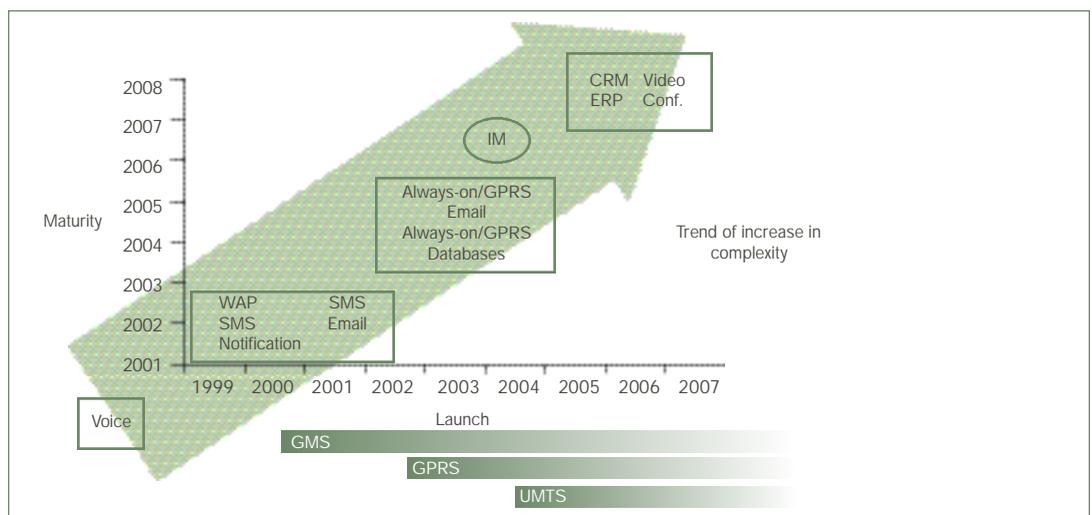
01. Machine-to-machine mobility solutions
02. New tools and devices to support new forms of 'always-on' collaboration

There is also a need for deploying mobility solutions to fulfill some intangible long-term objectives such as:

01. Positive customer perception
02. Increased job satisfaction among employees, whose job function will become easier by using the wireless solutions

■ BUSINESS APPLICATIONS AND RELEVANT PROMISING WIRELESS TECHNOLOGIES

Figure 4: Evolution of Mobile Solutions



Source: IDC

Some business wireless applications that are expected to gain significant adoption by enterprises and have a huge potential of success, fall into the following segments:

01. Wireless messaging
02. Remote access
03. Customer relationship
04. Tracking of goods and products

Wireless Messaging

Access to corporate e-mail over a secure wireless connection by the workforce on the move through hand-held devices and PDAs is expected to be widespread a few years from now.

Wireless instant messaging is expected to become a valuable application in the corporate environment. It

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allows a group of employees to 'whisper' during the conference call, or to reach a workforce on the move to check their availability. Combined with groupware functions, wireless instant messaging is expected to be an efficient way to schedule meetings and request instant confirmation.

Remote Access

Access to information, on the corporate Intranet or on the Internet from a mobile device, when on the move, is expected to be one of the key drivers of wireless data services in coming years.

Customer Relationship

Mobile sales force support over wireless networks is expected to be a realistic scenario in near future. Secure wireless access to (and capture of) data pertaining to customers will be very valuable to the sales people who spend most of their time at the customer sites.

Tracking

Mobile devices coupled with location-based information make it possible to track goods, products and mobile assets as well as to monitor fixed assets. Further, mobile devices are able to transmit their location to the network and can thus also be used to monitor the location of people on move.

Fourth Generation Wireless Technology

With a 4G solution it is possible to integrate different modes of wireless communications ranging from indoor networks such as wireless LANs and Bluetooth, to cellular, radio, TV broadcasting and satellite communication networks. 4G technology allows a seamless integration, such that the users of mobile devices can roam freely between various networks using different standards.

Advantages of 4G

01. Fourth generation (4G) mobile communication technology is expected to enable a significantly higher data transmission rate (up to 20 megabits per second) as compared to 3G. Further, 4G is expected to deliver 50 times higher connection speed as compared to 3G networks. 4G is also expected to offer three-dimensional visual experiences for the first time.
02. 4G terminals are expected to be a 'virtual reality device' that will identify users' geographical location, their needs and habits.
03. Existing wireless services are expected to become more cost effective and affordable following the introduction of 4G.

A Few Possible Applications of 4G Technology

01. 'IndraNet' is a fourth generation wireless broadband multimedia three-dimensional fractal communication mesh network technology endowed with advanced computing capabilities. An IndraNet™ is made of improved and miniaturised electronic devices generically called minders. These networks are designed to be self-routing and self-managing. Minders include a geo-positioning system, which enables wireless location tracking, and navigation. This network technology is expected to replace most of the wired as well as cellular infrastructure between long distance backbone carriers and end users, resulting in huge capital, operational and maintenance cost savings. This technology is also expected to deliver powerful computing capability to end users at an affordable price.
02. Another possible application of 4G technology is in 'telemedicine', where a paramedic assisting a traffic accident victim in a remote location can access relevant medical records and get assistance through videoconference from a doctor.

Some Other Promising Wireless Technologies

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01. *Bluetooth Technology*

Bluetooth is a wireless networking technology initially proposed as a way to replace cables, which are used to connect computers, PDAs, phones and other peripheral devices. For example, Bluetooth devices are available to connect mobile phones with hands-free headsets. Bluetooth has since inspired greater goals to enable the establishment of 'Personal Area Networks (PANs)' or 'piconets'. PANs are formed spontaneously when Bluetooth-enabled devices come into close proximity with each other. Bluetooth enables applications such as a laptop sensing a printer in vicinity and connecting to it automatically.

02. *Multimodal Markup Languages*

Typing in text on a phone's numeric keypad is a tedious job. Also, small screen sizes on phones and handhelds are hard to read and render the display of large amounts of information difficult. A solution that adds multimodal voice, text and graphics capabilities to web applications is 'Modularize VoiceXML 2.0' (XHTML+Voice). XHTML+Voice supports speech synthesis, speech dialogs, command and control as well as speech grammars. Another such solution is SALT (Speech Application Language Tags). SALT can take full advantage of events and scripting in languages that support them. For example, when used with HTML, SALT tags are just like any other HTML tags. SALT can be incorporated into any markup language belonging to SGML family such as Wireless Markup Language, Compact HTML, etc.

03. *SyncML*

Personal digital assistants and smartphones will be useful only when their information stores can be linked to similar information stores and to enterprise messaging servers. The best way to stay synchronized is to use a common protocol to pass text-based updates from one source to another. SyncML is a technology, which is expected to address these requirements optimally.

04. *802.11b Wireless LANs*

IEEE 802.11b enables use of radio frequencies in connecting computers and mobile devices with local area networks. 802.11b connections are usually faster than any other wireless connection. 802.11b wireless local area networks (WLANs) have an advantage of being cheap and easy to install.

05. *M2M Solutions*

M2M (Machine to Machine) business solutions, aimed at providing remote monitoring, control and management of different machines and equipment by leveraging wireless networks, are expected to render enterprise operations more effective thereby delivering cost saving advantages.

06. *Radio-frequency Identification Tags*

Usage of radio frequency identification (RFID) tags, consisting of silicon chips and an antenna that can transmit data to a wireless receiver, is an emerging technological development that could replace the usage of bar codes. The advantages, as well as the needs that still remain to be addressed by this technology, have already been covered in the 'Tesco' case study provided in the 'Needs of Businesses' section of this chapter.

■ BARRIERS TO ADOPTION OF MOBILITY SOLUTIONS BY ENTERPRISES

The most critical barrier to adoption of wireless mobility solutions by enterprises has been the network infrastructure. Enterprise applications require high levels of robustness and QoS (Quality of Service) from their networks. The current packet networks will take some time to mature to those levels. The plethora of mobile devices has resulted in varying levels of device performance, usability, application standards and computing paradigms (thick or thin client computing). Further, security products and techniques need to be strengthened to ensure that critical enterprise data is not compromised.

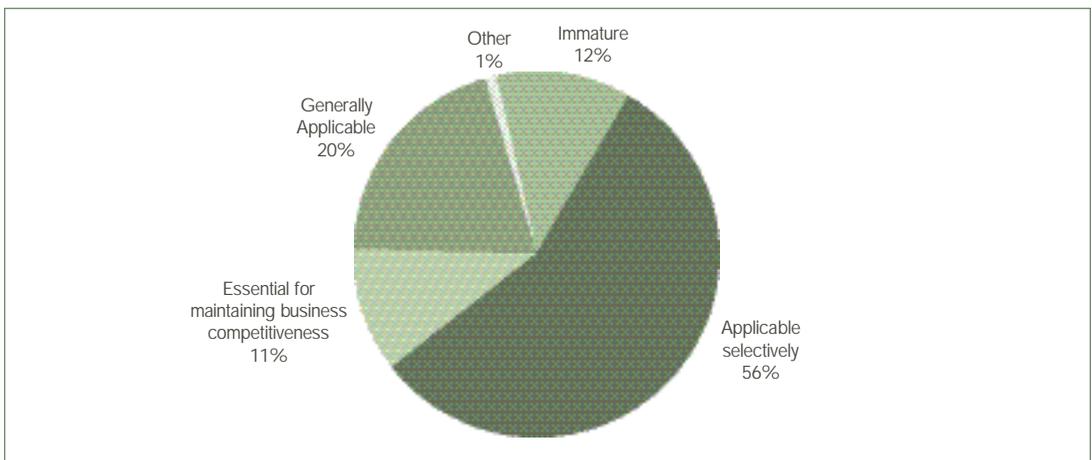
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EMERGING TRENDS

Mobile data has gradually evolved from the concept stage to the deployment stage. This progression has occurred despite the numerous problems and complex issues surrounding the implementation of this technology in enterprise space. The fact that enterprises have persisted with deployment of mobile data is testament to the commercial allure of mobile data.

Mobile data technology is perceived to be very relevant to their business activities by various enterprises. Some enterprises even believe that mobile data is 'essential for maintaining business competitiveness'. The following figure provides the current outlook of companies on mobile data applications.

Figure 5: Mobile Data - A Relevant Technology for Enterprises

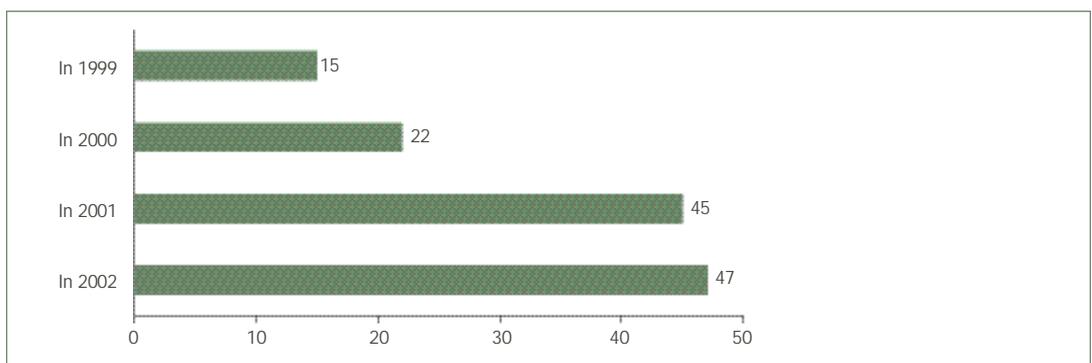


Source: Deloitte Research

In a recent study conducted by Deloitte Research, it was observed that 59% of the companies polled were using mobile data either for general-purpose operational activities (20%), or more commonly, for department level operational activities (39%). This clearly brings out the fact that mobile data is no longer only a subject of discussion among large companies.

Increasing frequency on a year-to-year basis has been a trend in various mobile data implementations. During each year, from 1999-2002, an increasing number of companies have deployed mobile data solutions. (See figure 6 below)

Figure 6: Implementation of Mobile Data Solutions (Percentage Increase in Deployment)

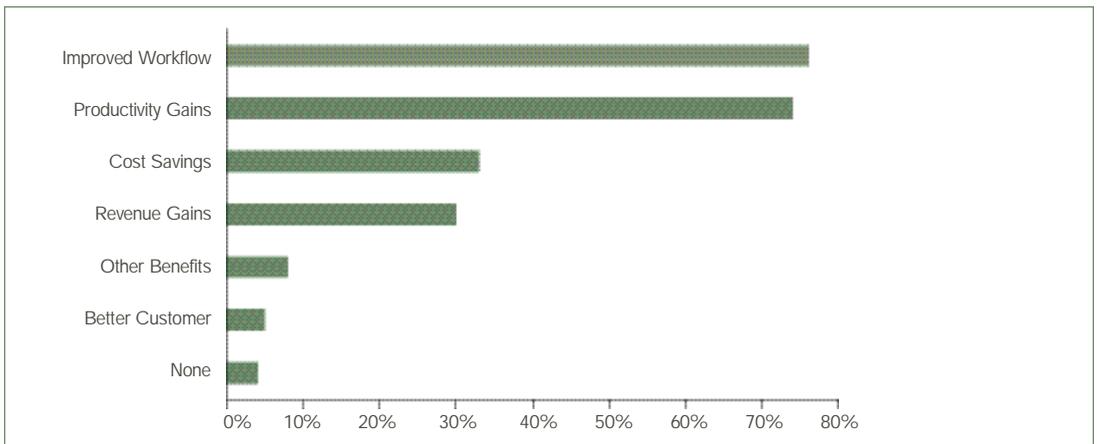


Source: Deloitte Research

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The most important benefits as perceived by enterprises from the deployment of mobile data solutions are 'improved workflow' and 'productivity gains' (see figure 7 below). Few companies also feel that revenue gains can be achieved by using wireless data solutions.

Figure 7: Principal Benefits from Mobile Data Solutions (Perceived Benefits: Percentage Scale is qualitative in nature, meant for comparative evaluation of relative importance of various parameters)



Source: Deloitte Research

Mobile data's arrival at the enterprise is warranted. However, mobile data's status is not yet solidly established. Mobile data is expected, in the long term, to consolidate its position as a key communication technology. However, the short and medium term prospects for mobile data require mobile data implementations to be based on a much higher degree of understanding of business needs than is currently the case.

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WORKING WIRELESS: HORIZON 2013

This chapter highlights some of the issues of the outlook and challenges for a mobile enterprise and builds some possible scenarios expected to emerge in the future.

■ MOBILE ENTERPRISE: OUTLOOK AND CHALLENGES

Outlook

Enterprises worldwide are aiming to becoming real-time enterprises (RTE). An RTE competes by using the most up-to-date information to effectively and efficiently execute critical business processes. This requires a software and network infrastructure capable of enabling any-to-any, 'zero-latency' information exchange between business applications and the managers, employees, partners and clients of the enterprise. This is known as the enterprise digital nervous system (EDNS).

A truly mobile enterprise has the following goals to achieve:

01. Creating value and lowering risks by reducing latency and elapsed time of processes
02. Communicating relevant information to all interested parties as soon as it is available
03. Complete end-to-end system integration
04. Reduction of financial risk by improving the transparency and frequency of financial reporting

Challenges

The basic impediments in the path of enterprises adopting wireless mobility solutions for their workforce are the following:

01. Security concerns
02. ROI
03. Quality of Service requirements
04. Integration issues

Companies are increasingly looking at device proliferation and connectivity options and weighing the costs and benefits of going the wireless way.

Currently, network infrastructures have high network latency, unreliable and intermittent transmission as well as low access data transfer capacity. Packet loss over wireless networks lead to degradation of quality of service and increases end user cost. Thus, immature network infrastructure is also limiting widespread adoption of wireless applications in enterprise space.

■ POSSIBLE SCENARIOS

Following are the scenarios, which are expected to emerge in future.

Scenario I

Widespread adoption of wireless technologies by enterprises worldwide with an emergence of fully integrated complete end-to end wireless mobility solutions.

• *Enterprise Outlook (Demand Side Perspective)*

Enterprises start realising ROI from successful deployment of mobility solutions. Security threats as perceived currently, wane away with wireless solutions providing unprecedented gains to productivity and offering significant value proposition to enterprises globally.

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- *Technology Market (Supply Side Perspective)*

Emergence of wireless mobility solutions that are fully integrated with the existing as well as future back-end applications and a consolidation in the technology market takes place, with only a few players emerging as market leaders in software and mobile space. Industry wide standards for various technologies emerge and compliant enabling software and network solutions become the norm.

Scenario II

Fragmented technology market with medium adoption of wireless technology solutions by enterprises.

- *Enterprise Outlook (Demand Side Perspective)*

Enterprises adopt wireless solutions only in niche segments. Businesses shy away from integrating their most critical business information systems and applications with wireless networks, rendering them inaccessible through mobile devices. Hence, wireless solutions add only limited value to the enterprises and their business activities. Only very limited ROI benefits are perceived by enterprises through mobile solution deployments.

- *Technology Market (Supply Side Perspective)*

Compliant technology standards fail to emerge. Technology market becomes very fragmented. Existing security concerns do not get addressed and integration with existing backend applications becomes very complicated, making deployment of wireless technology solutions by enterprises prohibitively expensive.

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Brainstorming Results

The Thought Leadership Forums are intended as brainstorming sessions to draw out and discuss the important themes and tensions surrounding an issue, not to reach a census or a single conclusion per se on the topic. Over the course of the Working Wireless forum, several things became clear:

- Users will be the drivers, both in terms of accepting or rejecting new technologies and in terms of using existing technologies in unforeseen ways.
- The wireless industry is not an island, but rather its future will be shaped by external political events, economic realities and the evolution of social structures.
- The company of the future will be virtual, in the sense that its employees will expect to (and be expected to) work just as well on the run as in the office.
- Major changes will occur as more machines communicate to each other wirelessly, in the form of technologies such as RFID tags and automated inventory.
- Government will have a major impact, be it in the form of spectrum regulation, health-related legislation and privacy-protection (or privacy-reducing) issues.

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Threats

Having discussed the challenges they face today, the Thought Leaders were asked to think toward the future in a brainstorming exercise. Looking through a list of topics, each picked the two that represented the greatest potential threat. Then, in open-forum style, the Thought Leaders proposed other ideas to build a master list of threats for the afternoon session.

No rank order was established, but some threats seemed to resonate with particular strength, including:

- The impact of health concerns, e.g. scientific proof of dangers such as handset-related cancer or 'electrosmog' from cellular-network antennae, which already today are political issues.
- The impact of regulations, especially regulations that are the product of powerful companies lobbying clueless politicians.
- A loss of trust by consumers, due to compromises in data privacy or misuse of personal data, undermining the value chain. As one Thought Leader noted, "In the relation between bank and consumer, the bank needs to trust technology to avoid fraud, but the consumer has to trust the bank. He doesn't care about the technology."
- Technological issues such as radio-spectrum shortage, battery-life problems, and virus attacks.
- Business-model destroyers such as services becoming purely commoditized, peer-to-peer networks, or release of unregulated radio spectrum.

Opportunities

As with the threats above, the Thought Leaders brainstormed to create a list of opportunities in the wireless sphere. Many of these proved to resemble the threats, just seen from a different perspective. Again, no rank order was established, but some opportunities resonated strongly, including:

- The developments driven by the first generation of wireless teens entering the workforce en masse. The possibility to have seamless global roaming.
- Wireless tariffs dropping radically, allowing greater usage and access throughout society.
- Technological developments, including much cheaper infrastructure and smaller devices.
- The revenue potential of permission-based marketing and context-aware services.
- Real improvements in quality of life, driven by wireless advances. "We need to focus on what customers want, the content they will pay for because it makes their life easier," insisted one Thought Leader.

The "Wireless Foresight" Scenarios

Setting the stage for the scenarios that the Thought Leaders would be working on during the entire afternoon, Bo Karlson of Stockholm's Royal Institute of Technology (KTH) and Jonas Lind of the Stockholm School of Economics presented the results of their nine-month exercise in scenario generation. Undertaken for the Wireless@KTH center, the project was published in September 2003 by Wiley & Sons as the book "Wireless Foresight." The focus of the scenario project was how the wireless industry might change in next 15 years. Their method involved establishing which factors could be assumed to be immutable (such as an aging population and companies striving toward monopoly) and which were uncertain (such as travel patterns, spectrum availability and the deployment of 3G networks), and then generating different scenarios by projecting different variations for the uncertain factors. For example: "How would the world look if we had \$10 base stations, that could be installed in 10 seconds and were biodegradable?" Or, "How would the world look if it turns out that mobile phones give you cancer?"

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Using this methodology the KTH project had honed in on four scenarios:

01. Wireless Explosion - Creative Destruction

This scenario projected explosive but anarchic growth. The number of possibilities for wireless usage would swell, but often in ways that created problems for telcos specifically and business in general. As traffic skyrocketed, the industry would become ever-more fragmented.

02. Slow Motion

Here, a Telco crash triggered by the industry's staggering debt would slow innovation. Judged to be mature, the industry would be deprived of new capital injections, meaning that the existing market leaders would hold their lead and no new significant players would emerge. At the same time, the success of user services such as Japan's iMode would not be repeated.

03. Rediscovering Harmony

This scenario predicts a backlash against today's high-paced frenzy in both the social and professional spheres, much like the "No Logo" backlash against brands and marketing that has taken place in the last few years among younger consumers. Nota bene: This value shift would take place only in the First World, where a certain standard of living can already be taken for granted; in places like China or Russia it would still be decades away.

04. Big Moguls and Snoopy Governmnets (No Borders, No Limits, Live Wireless 2013!)*

In this scenario, fear of crime and terrorism would be the main social and policy drivers. Big business and government would work together closely, maintaining a stranglehold on the communications spectrum. Internet access and wireless network access would be tightly controlled, eliminating any sort of anonymity. From an industry standpoint, such tight control would entail a limiting effect upon new and smaller players, making it a winner-takes-all environment.

Exploring The Four Scenarios

For the whole afternoon session, the Thought Leaders were divided into four groups, each assigned to work with one scenario that the KTH had evolved. First they discussed the scenario among themselves; next, they presented their findings to the group, triggering more discussion. Finally, they produced a mockup of a book, including choosing a cover, producing a table of contents and writing a back cover-style summary. The results of all four groups can be seen in detail, starting on the next page:

*Thought Leaders changed title!

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01. Creative Destruction/Evolution



Deciding to put a positive spin on the scenario - or perhaps just viewing things from the consumer side, rather than the industry side - the Thought Leaders decided to rename their scenario "Creative Evolution." As the group's presentation explained, "This scenario is not about globalization, it's about creating a series of global villages - big, diverse, democratic communities." They predicted a major explosion in services and applications along with exponential growth in the wireless industry. From the standpoint of existing players, the group stated, "It's a paradigm shift, but not just one shift. Not only do we have economies of scale for today's companies, but also at the fringes new players are taking a more active role." The KTH team added that in their analysis, modularization of technical systems is key part of this vision, allowing rapid spread of new developments.

This version of the scenario was met with major arguments. One telco Thought Leader, for example, said, "This chaos or anarchic growth effect could take place for content, but never in the last mile, because somebody always owns the last bit." Jumping to the group's defense, another Thought Leader made a counterpoint, saying that the whole scenario was contingent upon a release of currently regulated spectrum, and pointing out: "Once you have data being transferred over radio in unlicensed spectrum, what will matter is not the last mile of fiber, it's the internet protocol. And there the IBMs and Ciscos have much more power than the Ericssons of this world."

A further debate grew over the backbone of the scenario's wireless system, namely: Does the infrastructure have to be a single homogenous architecture? Obviously, the telcos would suffer if that were not the case, but for users it would not be so critical. With one major proviso: As one Thought Leader underlined, "People don't want to switch networks 20 times if that means they have to be constantly punching in passwords and losing connectivity. So, yes, we don't need to have a single network, but the usage has to be seamless."

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02. Slow Motion



The underlying assumption of this group was a major stagnation of demand due to three major factors:

- Cost, because there is a limit to how much the general public - meaning people who don't work in road-warrior mode and who do pay their own phone bills - will pay for always-on connectivity. And it's not just private sector who feel that way. As one group member noted, "Already, one company I work with does all communication

at home or in the office via IM or Voice over IP. It's only once you get out of range that people switch over to cellular."

- Usability, because only early adopters are patient enough to use clunky systems. "User interface could be a huge problem," said one group member. "If I need to do 25 clicks on my mobile to pay a parking meter, I'll just walk to the curb and do it with coins." (This issue came to the fore again in the evening, when two Thought Leaders publicly confessed they had never managed to get email on their wireless devices. Tellingly, they blamed their providers and device-makers, not themselves.)
- Potential health and environmental issues. As the group's presenter pointed out, "Just wait until the first \$1 billion medical lawsuit against a wireless company and see what happens to the industry. Do you think many people will want to invest?"

Once the scenario was opened for discussion, the KTH's Karlson pointed out that the cost issue is a major problem - and it's not about to go away. "Cellular infrastructure doesn't scale," he explained. "The main cost isn't the equipment itself. It's concrete, building roads, clearing local regulations. And people don't want to pay three times as much for three times as much data transfer, even if they get photos and video."

Depressing as the scenario might sound, many of the Thought Leaders viewed it as the most likely. "We're already in slow motion and have been for two years," noted one of them. But not everyone agreed. One Thought Leader said the main problem in Europe is not lack of demand, but overly rigid rollout strategies: "Korea, as a country, was broke five years ago, but they aren't talking about the global economy holding back innovation. In Asia - especially Japan and South Korea - they just release products without all the huge hype. When the devices come out they work, and if not they get pulled from the market. In Europe, we leave dysfunctional products out on the market instead of admitting mistakes." Predictably, other Thought Leaders - especially those from the telcos and device companies - disagreed mightily.

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03. Rediscovering Harmony



This group of Thought Leaders were posed with imagining a different way of living, where the central theme would be balancing personal life and work - either by giving each ample time, or by integrating the two. This is not so outlandish a concept; as one Thought Leader pointed out: "Already in some companies it's seen as a bad thing when you send an email on Saturday night, because it shows that you don't have your act together."

In many ways, this vision of the future runs counter to the more frenetic version often pushed by the technophile wing of the marketing world. The wireless industry would focus upon giving consumers only the services they need, at the times when they wanted them, rather than trying to push services down their throat. (Not that this latter strategy has really worked to date, anyway.)

These consumers would want standardization, not constant innovation. Wirelessness here would not be a tool for the road warrior, but would rather allow people to spend more time with friends and family. That change would recast our style of working, predicted one group member, saying, "If people are expected to work anywhere, anytime, it also means that their colleagues have to accept that they will sometimes be surrounded by kids or be on vacation during deadlines or major meetings."

Though this is not the mile-a-minute future driving so many current business plans, it would not necessarily be bad for industry. Permission-based marketing could be one revenue stream, pointed out another group member: "In the old days, there were jukeboxes where you could pay for music not to play. How much would you pay not to have ads on your TV?" Likewise, any service that created more time for personal life could generate money. "I think people will gladly pay miniature amounts for convenient services," said one Thought Leader. "But the volume will be huge."

After the group presented their vision, Karlson said it basically matched the KTH's scenario, adding, "We think there would be a lot of communication on the global scale, within tribes of like-minded people, rather than locally. The issue for service providers will be finding those tribes and offering them what they want in the right way." Another Thought Leader pointed out that the group had sketched a fundamental redefinition of society's relationship with technology. "What you're talking about is a replacement of technology hype with an embracing of deep and broad technology," he said. "Users would no longer be a geeks, just a regular person."

White Paper

04. No Borders, No Limits, Live Wireless 2013!



The shadow of George Orwell's book "1984" had hung over the forum all day, and this group of Thought Leaders pushed their scenario to its Orwellian extreme. In their version of the future, the DNA of citizens would be collected at birth and stored in a central data bank. An RFID-style chip would be implanted in their body, functioning as identity document, access key, credit card, etc. All data communications would be fully traceable.

The key driver leading to this scenario would be fear: fear of crime, fear of terrorism, fear of social unrest. As one Thought Leader explained, "Machine-to-machine communication would remove much of drudgery of life. People's responsibility would be stripped away under guise of government saying, 'It's for your own good.'" Likewise companies could offer consumers all sorts of conveniences in exchange for relinquishing responsibility - and any illusion of privacy. Of course, consumers would have very little choice, because the major monopoly powers would have quasi-governmental standing, and function together in a sprawling system akin to the keiretsu in Japan, under which companies are bound together by agreements to buy only from each other.

The underlying infrastructure of this system would obviously be very complex, including a relentless data-mining operation and monitoring of the citizenry's daily lives. But technological advances beyond that would be rare. "When large complex systems grow interconnected, it makes innovation harder," explained one group member, "because an entrepreneur can't just pull out one part and try to develop something better."

Frightening as this future might be, it's not pure fantasy. Pointing to the wave of attempted data-mining operations and other privacy-threatening initiatives unleashed in the United States after the World Trade Center attacks, one Thought Leader remarked, "We need to ask ourselves, as various regulations are put in place, 'What must we do to make sure this scenario doesn't happen?'"

White Paper

Brainstorming Results

The Thought Leadership Forums are intended as brainstorming sessions to draw out and discuss the important themes and tensions surrounding an issue, not to reach a census or a single conclusion per se on the topic. Over the course of the Working Wireless forum, several things became clear:

- Users will be the drivers, both in terms of accepting or rejecting new technologies and in terms of using existing technologies in unforeseen ways.
- The wireless industry is not an island, but rather its future will be shaped by external political events, economic realities and the evolution of social structures.
- The company of the future will be virtual, in the sense that its employees will expect to (and be expected to) work just as well on the run as in the office.
- Major changes will occur as more machines communicate to each other wirelessly, in the form of technologies such as RFID tags and automated inventory.
- Government will have a major impact, be it in the form of spectrum regulation, health-related legislation and privacy-protection (or privacy-reducing) issues.

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we are going to fund this through advertising and so on. Clearly the more attention you can guarantee to a supplier, the better you can monetize that, which has much more significant value. Add to that the very critical issues of voice channel, mobile messaging, including SMS and rich media messaging, mobile instant messenger, and then mobile video conferencing, and you have a model for the different types of interaction modes and content services that might be provided in the future. This then is a model, if you will, for content and services in the future.

Conclusion

I'd like to conclude then with the following points. By 2013, one-third of the world's population will be on-line. Add to that the convergence of communications and computing in the mobile arena and a vast sensor network created through things like location based services and you have an emergent global nervous system.

The extension of all of this,(and this is not an ominous thing in Big Brother fashion, but it present a tremendous opportunity for the future), the extension of all of this, is that we will see new social structures organized. These structures will evolve based upon mobile communications, and we will see the death of distance. The "global" teenager, the MTV generation, will realign along shared youth cultural values like music and video rather than traditional regional values. We will have extended organizations that will fuel the business of outsourcing to provide transactions and support unimpeded by location or time. All of this will be possible through a global network of "wired," virtual, and contingent workers.

The catalyst of mobile communications and computing will thrust society onto a new stage of techno/social and economic development as profound as the invention of the computer or the creation of the internet.

So this is the world in 2013—just a decade from now. I would propose that's the nominative scenario for the future.

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for computers); screen size and definition; network and infrastructure; device form factor and availability; usability and navigation; business models and cost of services; and finally, rich media content and services availability.

I'd like to take a look at these one at a time and see what just might happen in the year 2013, if we overcome these as impediments or barriers.

Bandwidth for rich media. If we tried to forecast this by looking at and extrapolating trends, and we talked with all of the knowledgeable people in the area, we will ultimately be looking at 4G mobile. People ask what is 4G? Well, the answers differ, but one thing which does not differ is a specification for 4G which is, of course, larger bandwidth. But if we're looking at 4G, then the problem of bandwidth will soon be resolved. We've already heard that Japan is planning on launching 4G four years early in 2006. If that's the case, then we are going to have an excess of 20 megabytes per second and that's going to be the equivalent of high definition TV on your mobile. I don't know about you, but I don't have high definition TV on my TV, let alone on my mobile. So that in my mind is going to be sufficient for the applications we have planned to run on my mobile in the future.

Storage Capacity. Right now you can get thirty to forty megabytes on an i-tune and that makes 7,000 audio files. Now turning to your "phone in the future," and extrapolating that to 2013, means we could have one terabyte of storage data on a mobile phone. Now that is certainly sufficient for my audio needs and certainly sufficient for as many videos as I can watch in a day. So lets go on—battery life. There's a big debate about battery life and a lot of projections for battery life just trail off and don't get there—so there's no end consensus, no final quantifiable conclusion. But of course, as history has proven, when there's a problem -- there's a solution. Right now, fuel cell batteries are very hot in the industry, and it was announced, just yesterday, that they are planning on having a forty-hour fuel cell for a laptop available in two years time. Extrapolating that to the year 2013, we can predict, in ten years time, we will have a fuel cell or battery for a mobile phone that will last a month and run a laptop for a work-week. You can see I hedged my bet—I wanted to say a week, but I wasn't quite sure; I didn't think I could quite get there. But a work-week will be enough for my laptop.

Screen size and definition. Screen size is of course an issue on a mobile phone, but now with high-resolution, paper-thin, flexible polymers with transistors being laid the opposite way end-to-end, you can have flexible display screens—screens that will adapt to any form factor from wrap-around to scrolling. Now I'm reminded of the rollout scrolls of the old days, so you can well imagine that type of a format being interesting for the future. So, screen definition is not a limitation.

Networks and infrastructure. We're anticipating (and people talked about this a good deal today) the opportunity for seamless— without authentication, without resetting the codes, without doing any of this— but seamless, roaming and authentication from a mobile through your Bluetooth to

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a wire line. That means one phone, one number. That means I can use it on a mobile, at the office, or on a beach. But it also means, I can use it at home with the same quality of service, perhaps going through my wire-line, to a wireless LAN, to a cellular network. A fellow at IBM was talking today about how they're going to hook up all the trains shortly. Those of you who travel on trains and fall out of the cells can easily imagine what this would mean. You would have the ability to go anywhere within the civilized world and stay connected. You could have seamless running and I think that would be a great enabler of business.

Device form factor and availability. And here I think we can safely say, that size and form are limited only by our imagination and function and not any longer by technology or engineering. That is a great liberating factor particularly for anyone who's working with designers. The logical limiting factors are constrained of course by the human form—take keyboards for instance. I know many of you have the early forms of the PDA's with little keyboards and you couldn't actually get your fingers onto the keyboard. So we have some natural human constraints, plus the effects of an aging population (vision, size), that make form factors, as well as content and services, important issues. In the end, display forms will be defined by the content and the services which are provided, however, all of these things will be resolved certainly by 2013.

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Usability. Finally, we come to usability and that's part of my background. This is going to be driven by the man-machine interface, and that's going to be defined by user requirements and not technological fads and interaction modes. Clearly, of course, in the mobile environment voice



Supply Side versus Demand Side

- As mobile industry moves out of exponential technology adoption growth phase and matures over the next decade, virtually all supply side issues of network, infrastructure, device, standards and security are resolved
- With the combination of smart devices, sufficient bandwidth, computing power, storage capacity and battery power, we realize the full potential of the convergence of communications, content and computing
- Consequently, with hurdles overcome, focus must shift to customer needs and drivers to develop new business models that will facilitate growth of the next phase of mobile communications and compute convergence
- This cycle of technology ingenuity and business invention is mirrored equally on the consumer side by demand for fashion, innovation and an insatiable human desire to communicate and collaborate

recognition and voice navigation are going to be major factors. As we all know, the algorithms to translate text to voice are quite simple. The reverse, voice to text, is much more difficult. But all this, in our view, will be resolved by 2013, so that it will be applicable in the mobile market, as well as in the automobile and transportation environments. All of these things are going to be major constructive enablers for both business and the individual.

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Industry Drivers and Enablers: The Next Stage of Growth

So then take that and say—done, finished, sorted. The network, the technology, the battery, the roaming, all of those things in the nominative scenario will be resolved. As we move out of the early stages of exponential adoption and growth, and demand issues over the next decade begin to mature, all of the supply side issues of network, infrastructure, device, standards, and security will be resolved. Smart devices, combined with all these enablers, are going to allow us to reap the full potential of the possibilities of the convergence of communications, content and computing. Consequently, with these hurdles overcome, focus must then realign on customer needs and the demand drivers that will compel us to develop new business models which will facilitate the growth of the next very critical phase of mobile communications and computing convergence. This cycle of technological ingenuity and business invention will be mirrored equally on the consumer side by demand for fashion, innovation, and an insatiable human desire to communicate and collaborate.

So what will be the key technology enablers and demand drivers of the future? — I’m going to go through this very, very quickly but there are some very important issues here. You probably know most of them, but think of them in the context of how they work together. Under technology, the key drivers will be: seamless connectivity, mobility and ubiquity, presence, location awareness, and services—not these things in isolation but what can you do with all of them together. Under

The look of tomorrow’s workforce will be altered with improvements in communications that make tele-working and virtual working possible

communications, the key points will be: voice, messaging voice, text, video, mobile instant messaging, video and still digital cameras. From an administrative standpoint, the key emphasis will be on how we can manage our time and our business through things like profiling, personalization, intelligent

agents, and personal assistants. And finally, the key drivers on the service side will be the content and application services that will be enabled by having full multimedia (music, video, gaming) and communication (MMS, data) capabilities.



Key Technology Enablers & Demand Drivers

- Technology
 - Seamless Connectivity
 - Mobility & Ubiquity
 - Presence
 - Location Aware and Services
- Administrative
 - Profiling
 - Personalization
 - Intelligent Agents
 - Personal Assistant
- Communications
 - Voice
 - Messaging: Voice / Text / Video
 - Mobile Instant Messenger
 - Video Conferencing
 - Video (Still) Digital Camera
- Services
 - MMS & Mobile Applications
 - Multimedia Music and Video
 - Gaming: Collaborative Gaming
 - Data, Content & Application Services

This future convergence of new interaction modes, i.e. mobility, ubiquity, presence, location services (like GPS), messaging, video conferencing, picture messaging, will all combine to enable new business processes, models, and to create entirely new industries. New business markets, models and consumers will be created around the growth of cottage industries and we will see more virtual e-Bays, SME’s, and outsourcing. We will

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also see more virtual working, virtual exchanges, virtual sales, contracts, payments, and verifications as a response to some of the same questions which were touched upon today, that is, what can we do in the “harmony scenario”, a term we heard earlier this evening? and what will we do as an aging population?

Within the corporate environment the convergence of interaction modes will enable customer-facing staff, like support teams and sales representatives, with tools like m-CRM, M-SCM, intelligent agents, advanced scheduling and location based services. All this, combined with business intelligence tools like collaborative filtering (this is the thing which happens when you go to Amazon and while you are looking at one book, they give you a listing of similar books by the same author), and you create an

extended commercial and virtual floor space out there in the big wide world. The look of tomorrow’s workforce will be altered with improvements in communications that make tele-working and virtual working possible. By extension, supply, distribution, and sales value chains will be revolutionized with RFID tagging systems and smart dust technologies.



Mobile Revolutionises the Enterprise

- Mobility, ubiquity, presence, GPS & location services, messaging, video conferencing, public knowledge contribute to enable new business processes, products & experiences
- New Business models, markets and consumers are created
 - Growth of 3G, virtual-empire, college admission, airport, emergency services
 - Virtual Working, Virtual Exchanges, Virtual Sales, Verification, Contracts, Payments
- Real Time, Intelligent, Extended Enterprise digital nervous system is enabled
 - Customer, knowledge-based, work, Customer Support, virtual enabled by m-CRM, M-SCM, intelligent agents, advanced scheduling and location services
 - Intelligent decisions, collaborative filtering, business intelligence with location based and proximity based services create extended networks & virtual floor space. Workforce is enabled and altered by communications. Tele working, virtual working, distributed working structures. Many streams, few steps, multiplatform access
 - Extended and even global sensor networks: RFID Tags, Smart Dust revolutionise creating people, mobility and distribution chains and create entirely new industries
- Higher and Global structure change
 - High-density total occupancy rates with migration from urban centers & virtual working
 - Transportation profiles change with suburban and suburban traffic congestion
 - Workplaces and operations reconfigure

User Scenarios



User Scenarios

The slide displays six small images illustrating user scenarios: a man in a uniform, a man in a car, a man in a suit, a woman in a market, a woman on a mobile phone, and a man on a mobile phone.

Okay, so lets turn now to how all this might practically look through a few user scenarios. One day we’ll have a grandpa who has a pacemaker connected to his Bluetooth and a monitor on his wrist. He’s goes out for a day at the park and while sitting on the parkbench slumps down with a hard attack. Fifteen minutes later, the family has already been alerted and a helicopter is circling overhead — I think we could sell products and services like that!

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Some business scenarios—you have a travelling businessman who all of a sudden finds himself in the midst of a huge traffic jam due to an accident. In our future world, he'll be able, with his location based services, to find a new route with maps. At the same time, his schedules and appointments will automatically be updated and reset to reflect his new travel time through his intelligent agent and/or intelligent negotiating PA. Another business example—an executive at the airport will have a video conference with two different parties on his mobile. With simultaneous instant messenger capabilities he will be able to send and receive data and information on his wireless mobile devices and will be able to organize his schedule and run his work life from the road.

Then we have the example of a lady in the grocery store who has just downloaded a recipe from the internet to her mobile phone. As she enters the store, she is alerted through the RFID tagging technology to the different items in the store which she needs to purchase for the recipe. Why you ask would she do this? Well, it's already being done and sorted on the inventory side, the supply chain side, so there's no reason not to extend this to the distribution side. Meanwhile, our female grocery-shopper, gets a beep on her mobile phone notifying her that her child has just left the grounds of the day care center. She knows this because the child is RFID tagged (not physically, just externally). In a panic, she does a video conference to the day care head and the head reminds her of the field trip they are taking today. You can think of any number of scenarios in which to combine and apply these technologies.

...you can be walking down the street or in a club and all of a sudden your ideal person walks by and you are alerted on your mobile device

Then there's the single dating female using her mobile device for profiling and customisation exercises. With the new mobile phones, the old mood phone and mood ring sort of thing, there will be different tools and applications such as collaborative filtering, psychometric evaluation, and database storage—you can let your mind wander with what you can do with some of these types of applications. For example, you can be walking down the street or in a club and all of a sudden your ideal person walks by and you are alerted on your mobile device (now this may be something you could choose to turn off or on).

As a final scenario, we have the "smart mobs". You've heard about smart mobs, the concept which helped overthrow Joseph Estrada, the former president of the Phillipines, through the manipulation of the crowds through SMS messaging. The same phenomena is now happening with "flash mobs" and teenagers with their virtual pub crawls and virtual treasure hunts. Now why am I talking about this? We're looking at this from the concept of the future. If we look to the future, we have to look at our children and what's happening with them and which applications they are using and these are some of the applications that will jump to the work environment. All of these, not just voice, but interaction modes and content and services will all be used in the future work environment.

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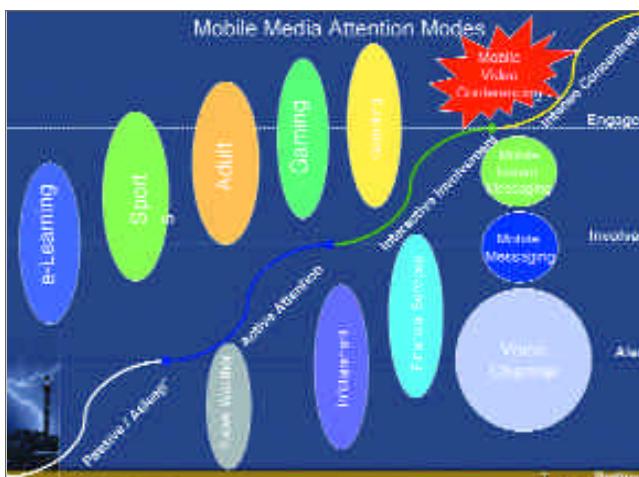
So now for the killer application. Voice communication is the major driver. Content and services are important, but voice is king. Voice is a killer application—it's a mobile phone. Think of this in the context of what I talked about before, seamless connectivity. Then as we enabled that with mobile messaging, instant messaging, email, video phone and then video conference, we



explode with a new variety of emergent services as we extend this beyond the mobile phone to the entire global nervous center. With the technical barriers removed, content services will become established but will remain secondary to communications, electronic and mobile commerce transactions and interactivity. Therefore, the prediction is that bringing all of these things together in the personal and professional context, we believe that mobile video conferencing will be the next killer application for the future.

Attention Modes & Mobile Interaction

Take a look very quickly at the research we are doing on attention modes (see FIGURE 6). We start out in laid back fashion in a passive asleep mode, then we move into the active attention mode, then on to the interactive and involvement mode and then on to the intense concentration mode. From passive cognition in the “asleep” mode all the way to multi-modal, multi-tasking in the intense concentration mode, each successive mode requires employing more and more complex methods of cognitive interaction.



So what does this mean relative to services? Have a look at some of the services offered in the mobile media attention modes (see diagram): weather, news, e-learning, sports, adult, (and unfortunately this is a driver in the industry) infotainment, financial services, gaming and gambling. As we begin to look at these, we ask ourselves, why is this important? Well, it's important for the development of services, the adoption of services, and the payment for services, particularly if

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we are going to fund this through advertising and so on. Clearly the more attention you can guarantee to a supplier, the better you can monetize that, which has much more significant value. Add to that the very critical issues of voice channel, mobile messaging, including SMS and rich media messaging, mobile instant messenger, and then mobile video conferencing, and you have a model for the different types of interaction modes and content services that might be provided in the future. This then is a model, if you will, for content and services in the future.

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