THOUGHT LEADERSHIP FORUMS 2002

Think Tank > Panel & Discussion > White Paper

FIRST TUESDAY ZURICH

GDI

Mobile Life: The realistic scenarios

10th September 2002

Results and Findings

Think Tank > Panel & Discussion > White Paper

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FIRST TUESDAY ZURICH GDI

FOREWORD

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Foreword

First Tuesday Zurich and the GDI introduced the Thought Leadership Forums 2002 Series to Switzerland as a new way to approach at key strategic issues.

We have looked to the power of independence and diversity, of different viewpoints debating the same issues, as an important tool to generate new insights and solve problems. In this world of increasing specialization, which is more than offset by escalating connections and globalization, our best chance for insight is often not individual or isolated experts, but networks. Networks of experienced professionals, which matched up with those with fresh perspectives, can work together to create knowledge and intelligence inaccessible in isolation.

We have worked to build on established techniques like brainstorming, and leveraged technology and research to create a format that is powerful, intense and extremely efficient. We view these Thought Leadership Forums as a dynamic format and platform to share ideas, push the boundaries, and create new insights.

The Question

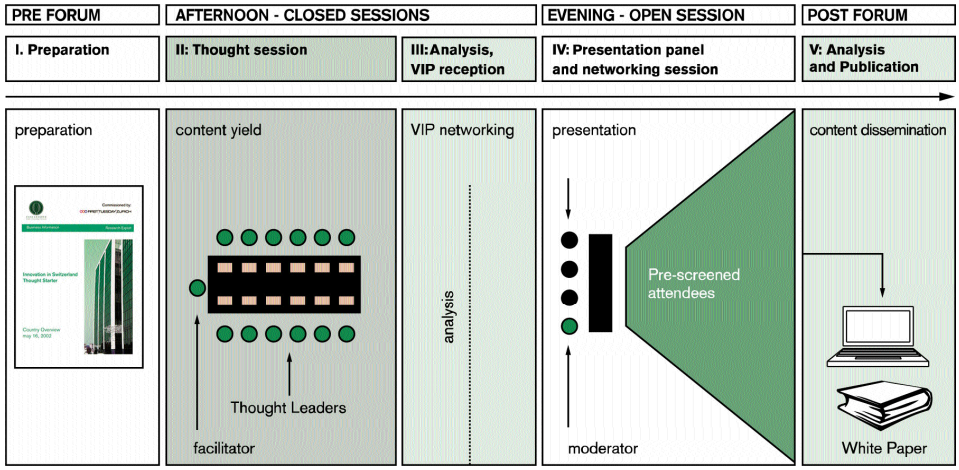
The concept of mobility – the idea that one is reachable and 'connected' around the clock and regardless of location – may be based on technological possibilities, but truly has profound impacts on how we will conduct business and our personal lives. Ultimately, it will also have sociological ramifications that will change the way in which we live, work and interact.

Though the recent hype surrounding various technologies and gadgets has left most people apathetic about the promised wireless future, mobility and its impacts are inevitable. This change will not necessarily be marked by high speed, but rather by sound uses for wireless applications that solve real problems – both business and private. And understanding the innovations and realistic applications that will mark mobility in the near term – the next five years – is a must for all businesses. This is because implicit in mobility is the opportunity to exploit the potential for revenue generation and cost savings and added value to daily life.

What are the tools and services of the next five years? And how will businesses integrate and fully exploit the possibilities of mobility? What are potential barriers and showstoppers? These and other related questions were the focus of this Thought Leadership Forum.

The Format

Prior to The Forum, a Thought Starter report providing background information on the topics is commissioned. The Forum begins with a structured brainstorming session bringing together a group of 10 to 15 Thought Leaders focusing on the topic of mobile life in the afternoon. Thought Leaders gathered on Tuesday, September 10, at the GDI in Rüschlikon near Zurich to spend an afternoon brainstorming together on realistic scenarios for mobile communications. Differing perspectives, as represented by senior level decision-makers from various sectors (network operators, device manufacturers, operators, researchers, information designers, software developers, visionaries, academia and business) accelerate the development of new and meaningful insights and ideas. The Thought Session was moderated by Michael Laursen from 3G Mobile.



Within a single afternoon and evening, this Forum provides an opportunity to meet, tackle key issues, and to discuss and disseminate the findings to a wider group. Following the Forum, the results were analysed and produced into a White Paper.

The Results

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

White Paper: This paper is the key analysis of the results of the afternoon think tank among the Thought Leaders, as well as of the input from the Panel Discussion and VIP audience.

Keynote, Mobile: what next?: This is the transcript of the keynote address from Julian Hewett, Co-founder and Chief Analyst at Ovum, one of the leading wireless analysts.

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

We would like to extend special thanks to our Presenting Partner Ericsson, our Forum Partners Credit Suisse Private Banking, Microsoft, and Swisscom Mobile, and to our Knowledge Partner, PricewaterhouseCoopers, whose support for this Forum was crucial to its success. Many thanks as well to our Online Partner Venturix and our Software Partner groupVision.

Negar Ayromloo
First Tuesday Zurich

Samuel Dubno
Gottlieb Duttweiler Institute

THOUGHT LEADERS

FIRST TUESDAY ZURICH GDI

Name	Title & Company Name
Maarten de Wit	Principal, DiamondCluster International (Barcelona)
Maia Engeli	Independent Researcher, Information Architect
Peter Fischer	Deputy General Director, Federal Office for Communications (BAKOM)
Hans Geser	Professor and Head of Sociology Institute, University of Zurich
Bruno Giussani	Author, 'Roam. Making Sense of the Wireless Internet'
Hansruedi Heeb	President & CTO, esmertec
Julian Hewett	Chief Analyst and Co-Founder (UK), Ovum
Stefan Kaiser	Senior Researcher - Editor in Chief GDI_IMPULS, GDI
Christian Kuhn	President, Ericsson Switzerland
Torbjörn Possne	Vice President WCDMA Systems, Ericsson (Stockholm)
Brian Potterill	Associate Director, PricewaterhouseCoopers (UK)
Lars Reichelt	Mobile Evangelist
Jan Reinhart	VP Marketing, DoOnGo Technologies (Silicon Valley)
Gert Rieder	COO Mobile, Sunrise
Thomas Rupp	Sales Manager Network Service Providers, Microsoft
Knuth Sexauer	Director Onstar Europe, GM Europe (Germany)
Carsten Schloter	CEO, Swisscom Mobile
Andreas von Gunten	CEO, Parx

Facilitator:

Michael Laursen	3G Mobile AG / Telefonica

Moderator:

Negar Ayromloo	Co-Founder, First Tuesday Zurich

Panel Moderator:

Bruno Giussani	Author, 'Roam. Making Sense of the Wireless Internet'

WHITE PAPER

FIRST TUESDAY ZURICH GDI

Mobile Life – The Realistic Scenarios

A summary of the findings of the 3rd Thought Leadership Forum
(Zurich, 10 September 2002)

Written by Boris Schneider, Zurich.
Edited by Negar Ayromloo, First Tuesday Zurich, Executive Producer of the Forum.

The concept of mobility -- the idea that a person can be reachable and "connected" at all time and regardless of location -- may be mainly based on technological possibilities, but clearly has profound impacts on the way we live and conduct business. This simple value proposition has allowed the wireless communication industry to grow spectacularly in the last several years. Even in 2001, with major markets nearing saturation and in the midst of an economic slowdown, growth rates remained close to 15 per cent. In most European countries, over 70 per cent of the population use a cell phone. "That a technology could reach this level of penetration in just a decade is unique, and it can only be explained by its consistently fulfilling basic needs of people: social connectedness, a sense of belonging, convenience in daily life and work, timely information-gathering, peace-of-mind"[1] .

The success of mobile telephony is therefore undisputed. Yet paradoxically the whole industry its torn by doubt, and its future looks stormy. The hype that has surrounded the development of wireless communication has left most consumers -- and business users as well -- rather apathetic or bored about the promised mobile future. The only "killer application" remains voice, as in voice telephone calls, with SMS as a surprising but lonely appendix. In everyday use, many new devices and technologies (GPRS, MMS, not to mention the stigmata-heavy WAP) are not fulfilling customer expectations, often providing a frustrating experience.

The lack of consumer confidence is not the only problem many companies in the wireless sector are facing. The high prices paid for next-generation mobile licenses (UTMS) have compounded the already difficult financial situation of most operators, crippling their ability to invest and innovate. A major wave of consolidation and restructuring has already started, and its ending is nowhere in sight.

So, where is the mobile communication industry heading? Where is the next growth to come from? What services and products are in the pipeline? Does the market demand these services, and are consumers willing to pay for them? What are the main obstacles the industry is facing? What impact could wireless really have on individuals, society and businesses going forward?

The 3rd Thought Leadership Forum has tried to answer some of these questions, putting a major focus on drafting realistic, short-to-medium-term scenarios -- where the emphasis is on the word "realistic". For the sake of the exercise, the horizon was set to 2005, and to help focus the discussion it was decided that Switzerland would be considered as the "model market". Switzerland, indeed, has one of the highest penetration rates of wireless in the world (close to 80 per cent), a high average in telecom expenditures, and a market with a high affinity to mobile devices. In this Summary, we present the key findings of the Thought Leadership Forum discussions.

1.Roam. Making Sense of the Wireless Internet, by Bruno Giussani (Random House, September 2002)

01. Key quotes

"Killer app"

"Despite all the hopes that the whole industry has for the next "killer app", there will never, ever be another application that will be used by 50 or 75 percent of the population – like SMS and voice."

Innovation

"The high level of debt cripples the industry's ability to invest and innovate. The results are often poorly engineered, untested and immature products and services brought to market, scaring many potential customers away."

Customer focus

"Marketing in the wireless sector is mainly technology-driven. Products and services boast technical finesse and strength, but do not solve real customer needs. They too often merely present a substitute for an existing product that is more efficient and cheaper."

Wireless LAN

"Wireless LANs pose a threat to the business cases many operators were preparing to push wireless data services into the corporate environment. But it can also represent an opportunity."

Cash cows

"Java-based applications like messaging would be more sophisticated than SMS and offer a true always-on experience, more cheaply. But operators want to protect their cash cow and hesitate to introduce technologically advanced products and services that could cannibalize existing ones."

Kilobytes pricing

"Transparent, straightforward, easy-to-understand pricing will be a key success factor of future wireless data services. Customers don't understand the concept of "buying kilobytes", and never will."

Standards

"When trying to agree on international standards for networks and applications, most players seem to be passing the monkey up and down the value chain and to regulators. As a result, only a limited set of applications do work across borders, and even handsets are incompatible."

DoCoMo

"The operators' role in the future will be to build platforms that allow large companies to improve their customer interfaces, and content and application providers to sell their services. A bit what DoCoMo has been doing in Japan."

02. Consumer applications

During the afternoon discussion, the Thought Leaders generated 107 ideas for mobile consumer applications, ranging from messaging and location-based services to entertainment and virtual worlds. Applying the "realistic" and "short-to-medium-term" filter, the ideas were then reduced to key categories. Overall, the Thought Leaders agreed that the first wireless data applications to appear in the market with a potential of success and significant uptake will fall in the categories of:

- Wireless messaging
- Entertainment

The following applications were discussed as examples:

Wireless messaging

Wireless e-mail

E-mail has been and still is the main reason for Internet usage. Extending its reach to wireless devices is a straightforward, logical step towards enhancing interpersonal communications. However, most mobile devices today lack an adequate interface for inputting long messages. Letters either have to be typed using number keys, small keyboards or by handwriting on a touch screen, which limits the convenience. Also, it still takes a considerable effort to set up a mobile phone for receiving e-mail messages. It appears however that e-mail will soon be available in the palm of many users.

Picture and multimedia messaging

As the natural successor to the text message (SMS), many network operators in Europe put high hopes on multimedia messaging (MMS). This service will allow users to send and receive messages with full multimedia content, and uses preferably GPRS or 3G infrastructure. During the past months, network operators in many European countries have advertised MMS broadly, yet only two commercially available handsets are ready for it, and some incompatibility issues remain to be solved. However, the Thought Leaders agreed that on the medium term picture and multimedia messaging has a huge potential of development, under three conditions: that it is easy to use (therefore, devices must be further developed); that the quality of the images taken with the built-in camera is good; and that pricing schemes are not punitive.

Wireless instant messaging

Instant messaging services – such as AIM, Yahoo Messenger or MSN Messenger – have added an important dimension to Internet e-mail: presence information. Through IM indeed, the users can gain visibility on the availability online of their "buddies" at a given moment, facilitating the process of immediate interpersonal communication. A wireless extension is a natural step, and several mobile IM systems are being developed and start to be offered as services by some operators. Thought Leaders however pointed out repeatedly that in order to be valuable to the user, wireless IM needs to be fully integrated and be part of a larger system, allowing users to transport their "buddy list" from the fixed Internet to mobile devices, and to remain connected to their community in a transparent and easy way wherever they go. It was also mentioned that IM presents a major danger for operators, for it represents a very powerful alternative to SMS, a current major cash cow.

Entertainment

Gaming

Anyone who has already tried to play an electronic game on his cell phone probably concurs that, at first glance, mobile games are a poor substitute for PC and console games. However, they do offer things that fixed devices can't offer. Users carry mobile devices everywhere, and packet-

switched wireless networks (GPRS, and in the future UMTS) enable "persistent" games that can be played in short bursts over a period of days or even weeks, across several devices. As soon as wireless networks will be able to pinpoint with a certain precision a user's current location, "massive multiplayer" games can take place out in the streets, taking advantage of the steady evolution of chips, processing power, form factors, screen quality, and software. The very nature of electronic games, with their corollary of compulsion and addiction, will probably constitute an additional driver.

Adult content

Last year, the wireless industry raised a collective eyebrow over news that British mobile operator Hutchison 3G had appointed an executive to oversee mobile adult content. Although very rarely discussed in "serious" business gatherings, porn still is one of the biggest money-makers on the fixed Internet, and it appears that it is starting to branch out into multimedia-enabled mobile devices. The initial (stated) disgust of some network operators will eventually be overcome by the prospect of potential revenues. With color screens and increased memory, mobile devices are ready for adult content and services, in the form of pictures, texts and videos, but also of location-based dating services, etc.

03. Business applications

During the afternoon discussion, the Thought Leaders generated 150 ideas for mobile business applications, ranging from access to corporate databases to customer support. Applying the "realistic" and "short-to-medium-term" filter, the ideas were then reduced to key categories. Overall, the Thought Leaders agreed that the first business wireless applications to appear in the market with a potential of success and significant uptake will fall in the categories of:

- Wireless messaging
- Remote access
- Customer relationship
- Tracking of goods and products

In all cases, it was stressed that for transmitting critical corporate information the systems and devices had an absolute requirement to be secure and protected against both loss of data and malicious attacks. The following applications were discussed as examples:

Wireless messaging

Secure corporate wireless e-mail

Access to corporate e-mail over a secure wireless connection when away from the office will be a very widely used service in 2005. Many mobile operators across Europe have already introduced or announced integrated solutions for wireless access to corporate e-mail systems (such as MS Exchange or Lotus Domino). The introduction may however be delayed due to the rather high costs associated with this solution, in a period of economic difficulties for many companies. Moreover, in recent years most workers have acquired PDAs and other mobile devices individually, which makes it difficult today to define enterprise-wide wireless strategies (choice of standards, training, etc). Nevertheless, most Thought Leaders consider the benefit of wireless e-mail to be so significant that it will outweigh these obstacles.

Corporate instant messaging

Wireless instant messaging will also become a valuable application in the corporate environment. It's always-on character allows for instance to "whisper" to a group of employees during a conference call, or to reach a group of workers or salespeople simultaneously when they are away and check on their availability. Especially when combined with groupware functions, wireless instant messaging can be an attractive way to schedule meetings and request instant confirmation.

Remote access

Remote access to corporate data and to the Internet

The ability to access information on the corporate Intranet or on the Internet from a mobile device when away from the office is considered one of the key drivers for the introduction of wireless data services. In light of recent developments in the area of WLAN (Wireless Local Area Network), the question may be how much of the corporate data will pass through GPRS and UMTS networks. WLAN offers a higher bandwidth and is poised to represent a valuable offer in so-called "hot spots" such as airports, train stations and large office buildings, allowing users with laptops to connect wirelessly at high speed. Many industry analysts expect 2.5G and 3G networks to fill the gaps, in a sort of "concentric circles" network structure.

Customer relationship

CRM (Customer relationship management)

CRM applications (Customer Relationship Management) offer access to vast client data and facilitate selling efforts and relationship vigour. At the same time, they are an important source for real-time data mining. Especially in those organisations where sales people spend a lot of time at customer sites, secure wireless access to (and capture of) such data could prove very valuable. Mobile sales force support via wireless networks is expected to become a realistic scenario during the next two to three years. Most specialized vendors like SAP, PeopleSoft and Oracle will have included fully mature mobile options in their products by 2005. This will partially eliminate the need for complex middleware and facilitate the deployment of CRM solutions.

Tracking

Tracking and monitoring of people and goods

Mobile devices coupled with location-based information make possible to track goods, products and mobile assets (freight, trucks and containers, for instance) and to monitor fixed assets (machinery). On the other hand, mobile devices are able to transmit their location to the network and can thus also be used to monitor people, for instance to track and monitor the well being of elderly or disabled persons in and around hospitals. As with all location-based services, a great deal of attention will have to be spent on privacy matters.

04. Showstoppers

Thought Leaders also spent part of the afternoon discussing potential "showstoppers" -- obstacles that affect or could affect the development of the industry and of mobile applications and services. The major hurdles identified during the discussion are summarized here:

Financial situation

The mobile communications industry has particularly suffered from economic setbacks in the past two years. Market saturation has rendered the introduction of new products and services more difficult. The company's debt, already significant due to the push for market share of the 1998-2000 period, has been compounded by the huge sums paid for next-generation licenses in many countries. Overall, total debt of wireless operators in Europe is well above 250 billion euro. Consolidation is thus occurring on a large scale and many players that once were aiming at expanding globally are forced to restructure and re-focus on their core markets. Debt significantly limits the operators' ability to invest and innovate, and make them hesitant to introduce new propositions that could cannibalize existing lucrative services, such as SMS. As one of the Thought Leaders puts it, "we are just at the beginning of an amazing discovery: that 3G is way more complicated, technologically complex, and commercially multifaceted than anyone in the industry is willing to admit; that it will take longer than foreseen for the new services to be deployed and be taken up by consumers; and that it badly needs innovative yet more pragmatic ways of imagining it".

Pricing

Multimedia messaging (MMS) may be immediately compelling for some users such as teenagers – but will these prospective customers pay 1 euro for sending a picture to a friend, or as much as two or more euros for viewing a movie trailer on their handset? This is just an example, but it clearly appears that nobody really knows what "wireless data pricing" can and should mean in the future. Revenue projections are based on the most disparate figures. Most operators are struggling to design pricing schemes that are clear, transparent and easy to understand (most consumers won't "buy kilobytes") and that at the same time have some level of connection with the value of the service as perceived by the consumer. One of the main reasons for the exceptional success SMS had in the market is its cost transparency. Pricing will most definitely play a role in attracting third-party service providers. NTT DoComo's i-mode service has been a commercial success mainly because of attractive conditions for third parties to sell their services and content over its the infrastructure.

Interoperability

The greatest, yet underestimated strength of the PC world is what most users simply take for granted: a wealth of similar software running on every PC. In the mobile world, especially in the area of wireless data, there is yet no real standard for handsets, operating systems and applications. On the level of the operating system, for instance, we witness fierce competition between Microsoft's Pocket-PC and Symbian, supported by Nokia and Ericsson, among others. Most applications, as a consequence, cannot easily be ported from one device to another. Even using a service like MMS to send a picture to a friend that uses another brand's phone may still hit incompatibility problems: there is no guarantee that the snapshot will arrive on the other device. If it arrives, it may be partially scrambled or totally unviewable. Device manufacturers and software developers will need to work on a common set of standards. Otherwise, most future services will have a hard time reaching critical mass.

Roaming

The lack of interoperability is indeed just one part of the puzzle. In fact, it looks quite pretentious for the mobile industry to label itself “mobile”, as a large number of services and applications do not really work across borders. Consider GPRS: most operators have only signed a small number of roaming agreements in foreign countries. This renders a number of possible applications, especially in the business area, rather useless because mobile professionals cannot use them when travelling. When travelling to the US, for example, users need to carry a tri-band handset. With future wireless data services that are technically even more sophisticated, compliancy and roaming issues will urgently have to be addressed.

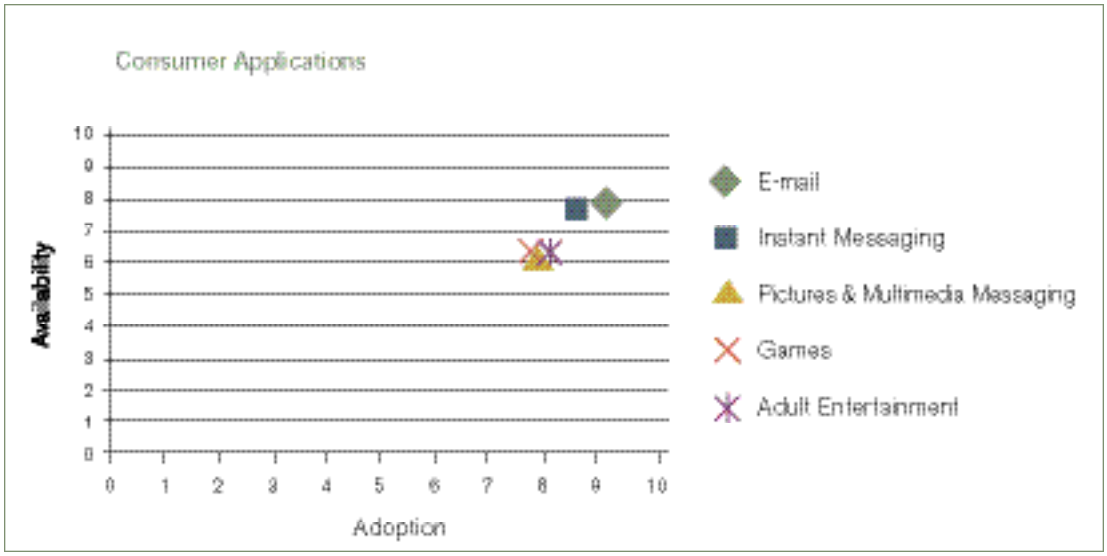
Customer focus (lack of)

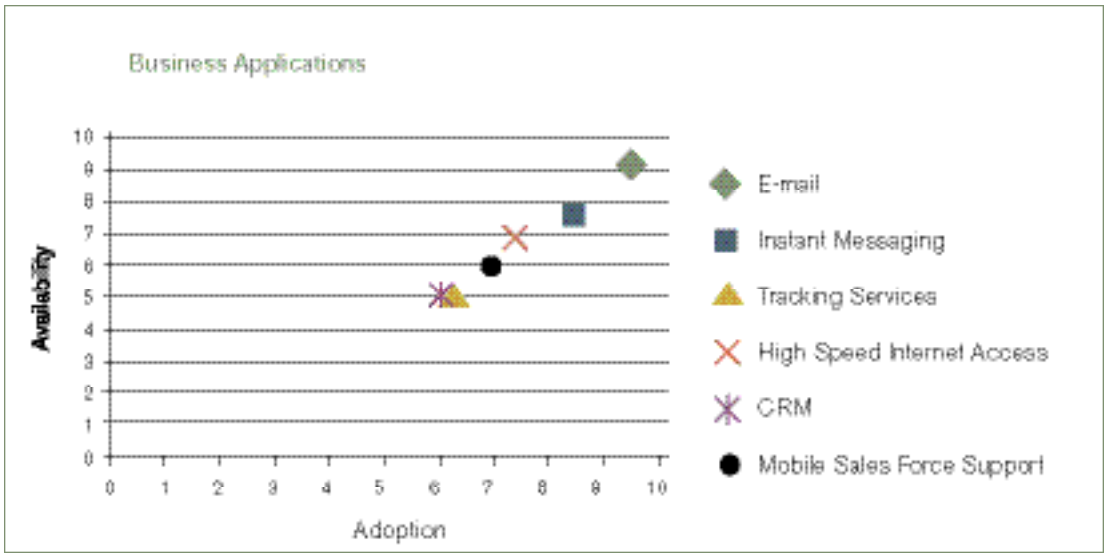
UMTS, GPRS, HSCSD, WAP, MMS, SMS: Like no other, the mobile industry relies on technology-driven marketing for selling products and services. But this approach has led to consumer frustration and apathy about upcoming technological advances. At the Thought Leadership Forum, the consensus was that the industry has ignored its customers for too long. The difficulty for mobile network operators and handset manufacturers is, however, to solidly predict what users will really want and be willing to pay for. The new GPRS handsets by Nokia and Sony-Ericsson were introduced to the market as Internet-enabled phones. But people don’t seem to have purchased them for their wireless data capabilities, but rather for their colourful screens. SMS was an unexpected, grassroots phenomenon. WAP instead, which was heralded as the "Internet in your pocket" and drew huge industry bets, was a failure. The industry will have to choose a gradual approach and carefully test out services and applications in order to better understand customer’s needs and match them with innovative offerings.

Even if the mobile industry is able to work through most of these stumbling blocks, its biggest challenge will be in focussing on the real needs of their customers and delivering services that are innovative, compelling and bring convenience in daily life.

05. Audience Survey

Evening participants were asked to vote on the likelihood of availability and the likelihood of adoption of the applications identified by the Thought Leaders. They fully agreed with the Thought Leaders' expectations that all these applications would be widely available by 2005 and used by a significant portion of wireless subscribers.





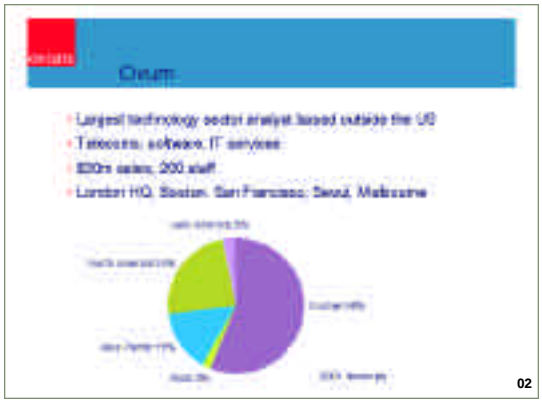
KEYNOTE

Mobile: what next?

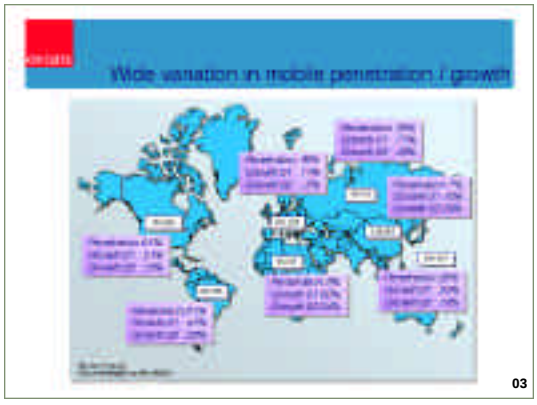
Julian Hewett, CO-Founder and Chief Analist, Ovum

Thank you for inviting me to this Thought Leadership Forum.

I have been following this industry for a long time, at least 25 years and the last 4 years have really been the most extraordinary period in our sectors. So I think it is a good question that we are trying to ask here - what is next - because we have really seen it all in the last 4 years. I am coming at this from the perspective of an Industry Analyst, and for those of you who are not familiar with Ovum, that's who we are. If you need to know more please visit us at ovum.com **(Slide 1 &2)**



Now we have a leadership role in wireless in Europe because we have reached maturity in terms of penetration. We have between 70-80% penetration in most countries in W Europe, and higher in others, but subscriber growth is coming to a halt. **(Slide 3)** This is causing some of the severe problems that we have today. Now I am an optimist and I think that long term, we will see new growth. The trouble is that we have some indigestion like this poor snake here, which is trying to



eat something rather larger than it should have done. **(Slide 4)** We have tackled in our industry, we have tackled the Internet, we have tackled e-commerce, we have tackled digital TV, broadband, mobile, wireless data, wireless LANs. If you are in the business community, then there has been Y2K, we have had CRM, supply chain management, it goes on… and we are just trying to digest all of these things and make some sense of them.

Even in my own house, 10 years ago, I had one fixed telephone. Today I have 9 different telecoms channels coming into my house, the fixed line, the second fixed line, ADSL, digital cable and unfortunately from a telecoms perspective, I have 3 daughters. Now that means that of course we have 5 mobiles and sometimes it sounds as if half of Europe's SMSes are terminating in my house. (By the way, I have to pay all 9 bills unfortunately, so after my presentation please give generously.)

But I think the serious point is, when I look at my kids who conduct their social life, through their thumbs of course like I am sure yours do, we can see that this is the generation that is coming into the workforce in future years and they will expect this technology to work properly. So that's the long term, short term we're stuffed.

Has anyone seen a film called "An Italian Job?" It's a rather old British film, but it really struck home because it was replayed on the TV a few weeks ago. It's about a bank robbery. It's actually set not far from here in Turin. And basically it's an excuse for a car chase. And it's a fantastic car chase through the streets of Turin and they wind up driving through the Alps and eventually they get into this coach which you see here and they are driving to fast and they swerve off the edge of the road and they finish up balanced on the edge of this cliff. **(Slide 5)** And unfortunately the money is here and the thieves are there and this coach is balanced and every time the thieves try to walk towards the money, the coach tilts over. And so they are stuck and there is no room for manoeuvre. And they can't get at the money. And it's a bit like that now because there are all these things we want to invest in, in telecoms and we are being held back…we cant quite get at the money because unfortunately the accountants are in control right now.

So I said we were in a mature market and operators in Western Europe at least have to say hello or welcome to single digit growth. And from a stock market point of view, for example, is even Vodafone now to be considered as a utility stock, like the gas or electric company. **(Slide 6)** Because when you look at their numbers, if you look behind the acquisitions, their organic growth was just 9%. Single digit. They do expect some subscriber growth in the next 2 years. If you take the long-term view and you make the extraordinarily optimistic assumption that even if they do double over the next 10 years, that's just 7% compound growth. Even after falling by a factor of 3 or 4 that's still 2 and a half times revenues and these ratios are much higher than you would get from a utility where probably the revenue multiple will be less than 1. So I am sorry there is an intentional mistake here, even today wireless companies are not under-valued, I should say. Freudian slip. So in a mature market, we need to look more at profit, rather than revenue. So a few weeks ago I decided to do just that on comparison. And this takes the top 10 largest wireless operators based outside of the US or excluding the US - this is Europe and Asia Pacific. And there they all are and you can see pretty wide variation in both revenue and profit. So it will make a little more sense of that if you look at it on a margin basis so this is exactly the same numbers but on a percent basis Ebitda and operating income.

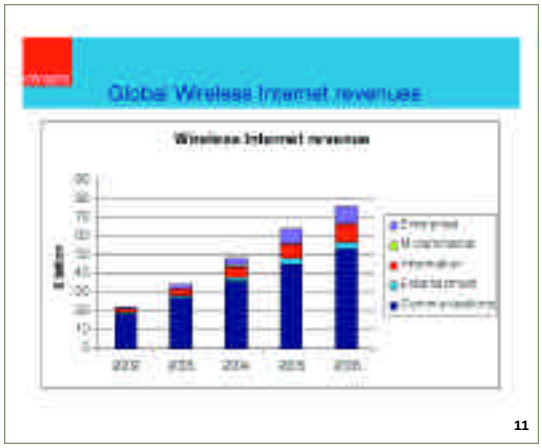
Now what does this tell us about our industry? First of all, it is an incredibly profitable industry if you get it right. We are looking at margins of 20-40% there, which is marvellous. **(Slide 7)** I would say the second thing that you can tell by looking at numbers like these is that market dominance matters. The operators that have largely stayed at home have done best. And perhaps the only real exception is Vodafone, which has managed to make a success of an international business. Whereas if you're on the right hand side there, MM02, T-Mobile to a lesser extent Orange, you have not made a financial success thus far. **(Slide 8)** And the prospects quite honestly don't look too good either. So I think some kind of consolidation is inevitable in Europe. At the operator level, this is a game of scale and probably not too much differentiation. And large countries in Europe will probably only support 3 operators in the long term - perhaps typically the incumbent subsidiary, a Vodafone subsidiary and one other. **(Slide 9)**

So I think we can see some consolidation likely in Germany, Italy, Netherlands and the UK. We are all waiting to see what happens this Friday from France Telecom, to see whether they are going to pull out from Germany or not. So that could be the first step along this projection.

Smaller countries may just have 2 operators. But at the same time I think we can expect some more virtual service competition, for example from retail chains, utilities and affinity groups.

Now this afternoon we have been looking at wireless applications, and the big problem we have in this industry is that there is little confidence in multimedia applications. And we have gone right from all this hype to the bottom of sentiment. This is a cartoon that appeared in the English press a couple of weeks ago. **(Slide 10)** And I am sure you are all better behaved here in Switzerland, but unfortunately when fax was really taking off, 10, 15 years ago, what you did was take your trousers down, you sat on the fax machine and then dialled your friend and that was the killer fax application. So the point of this cartoon or the point that this cartoon is making is 'oh my God is this the best multimedia application that we can think up for 3G?' And that's what's happened to sentiment in our industry. So if we look at the market place we have this big accidental success called SMS which you can see in the blue in 2002, that's the communication slice of wireless internet. (These are data revenues excluding the voice piece for the time being.) **(Slide 11)** And we still think that there is plenty of mileage in communication, messaging, type applications – whether its SMS, MMS or whatever. That's where the big money is

still going to be in terms of what people spend on at the end user level. And there are other applications which have been well documented, enterprise, M-Commerce, information, entertainment and so on – that's going to remain the minority. Having said all that, this is all complete guess work. Although we are paid to produce these forecasts, nobody really knows what is going to happen in this area so we have just got to experiment and hope for the best. I would say these are on the pessimistic side for the non-communications applications, but the big challenge with all of this is substitution. Most of the things we can think up and do on wireless internet, there is some other substitute, whether it is on fixed internet, or on paper or whatever. And normally they are free.

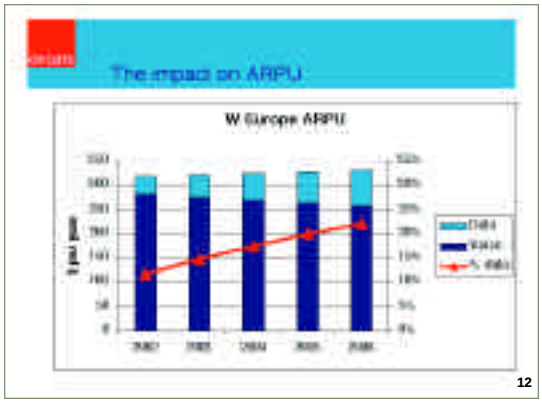


As far as the role of the different players, it is very important that the operators find partners for the bits above the communication application because those are the ones which are high risk and those are the ones that are a high cost to deliver. So it is important that other people who probably know more about the applications areas are looking at that.

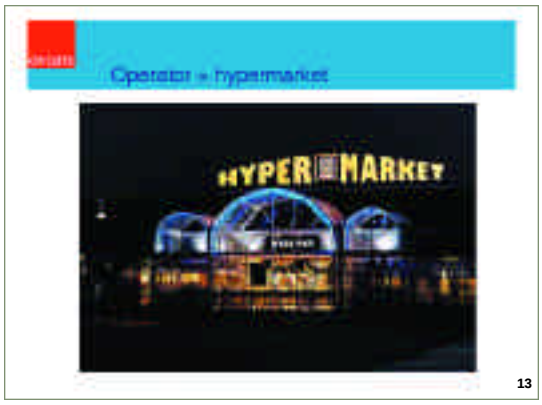
Early indications from Korea and Japan are of course very interesting. Some things have taken off really well but some of the market research also shows that there is high price sensitivity to these kinds of applications. Partly because a lot of them are used to kill time commuting and so on. There is high price sensitivity so I think we will need to remember that too.

Disappointing start in Europe. We have had GPRS which has started to appear. Lots of sales of GPRS phones but not because they are GPRS - its because of the colour screens that people want. So at least the good news is that we are beginning to build up our population of GPRS terminals.

(Slide 12) Impact on ARPU, again nobody really knows what's going to happen. The good news is that at least with the arrival of the data (in the light blue), with that expanding or continuing to expand we should stem the decline in ARPU that we have seen since the wireless industry began. On the other hand, its not exactly stunning growth if that projection comes true. We think that the voice ARPU will continue to decline not least because it will continue to come under pressure from the fixed operators. Of course they are going to fight back and that's even before considering the possibility of voice over IP.



I mentioned that for these new wireless data applications it's best if the operators work in partnerships to get the products and services out there. In fact, it is useful to think like a hypermarket. **(Slide 13)** So if you think like a hypermarket, supermarket, the hypermarket has the customer relationship. It has the billing relationship; it bills the customer. It has this fantastic access; it has this big car park, and the aisles and so on. And what it does is it offers a wide range of mainstream products but virtually all those are sourced from other people. So I think that's a good analogy for new wireless data applications and that's the way the industry needs to think.



I thought I would finish with a few comments on 3G and this is a fantastically complex and expensive infrastructure project and its going very wrong at the moment as we have heard just now from some of Negar's press comments. I think of it or rather I would like to think of it in future like the channel tunnel. Maybe because I am British and have it etched on my memory. Today, I think of the channel tunnel as this fantastic success. **(Slide 14)** It is wonderful, it has changed my life and I would not dream of getting on a plane to go to Paris or Brussels. You get on this train and go through this 30-kilometer tunnel. But at the time it was being built, it was a financial disaster and we went through an enormous debt for equity swap. The original investors in the channel tunnel company were wiped out. So a lot of initial financial pain. Now I don't think we are going to have that level of pain with 3G but certainly a lot of the assets on balance sheets are going to have to be written down at some stage. Indeed some of them already have as we have heard from Telefonica.

The industry is its own worst enemy because it really hyped up and built-up 3G to be something extraordinary. Hence the position on the right hand side. Mass-market multimedia that was going to change our lifestyles. And as we all know today that has low credibility and that there is also a capital investment squeeze. **(Slide 15)** So we believe there actually needs to be perhaps a bit of a shift in mindset towards the left hand side and that we need to change to thinking of 3G as being more of a capacity relief and using it in that way, to solve some of the 2G congestion that is starting to emerge and in which the main application is still good old voice.

If it were possible to do this, we would have a much lower roll out cost and we would be able to spend that investment in areas where we needed new equipment anyway. Plus it is cheaper to run voice on 3G, or at least we believe it will be. Unfortunately there are the licence conditions with the coverage requirements which need to be met, unless they are significantly relaxed by the regulators. At the moment at least, we barely have any 3G phones but there are certainly not any low cost, fairly basic 3G devices coming onto the market. So we need some more degrees of freedom to go forward and I think that to me that seems like the logical way forward. But it does need a major shift in the thinking of the entire industry.

(Slide 16) Whatever you believe, whether you see the scenarios being the multimedia limping along or whether you go for the capacity relief scenario, prospects for 3G are not that great. Here are some latest forecasts from Ovum.

Incidentally, back in 1997 we wrote a report which said that 3G was not going to take off till 2004 and we were ridiculed for that, now it looks like even we were too optimistic. It just goes to show that most forecasts are too optimistic. This happens to include CDMA1X which is the standard used in Japan and some of Korea and

some of the US. Arguably, that could be counted as 2.5 G. So, if you included GPRS here the graph might look significantly different. However you define it, it is not a happy picture right now and it is going to be slow and gradual.

(Slide 17) I hope I have made the point that nobody knows what's really going to happen over the next few years. What we need is lots of experimentation. I have absolutely no doubts that there will be more disappointments along the way. There are of course continuing investment constraints. Long-term, I am an optimist but I believe the next 5 years will continue to be difficult. And I'm afraid that we must all learn to be patient.

Thank you.

THOUGHT STARTER

FIRST TUESDAY ZURICH GDI

Evalueserve Research Expert: Mobile Life: The realistic scenarios

Business Information – Market Overview 25/06/02 – Research Expert

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EXECUTIVE SUMMARY

Enormous growth is taking place in the wireless communications market due to the basic value proposition of 'always-on connectivity from any location'. In 2001, the wireless communications market grew at the rate of 15% in all the major regions of the world, except in North America, where growth was around 9%. Switzerland, with a penetration of 74.8% in mobile telecommunications, is likely to be one of the key markets for wireless technology and applications. Given this scenario, the Thought Starter, "Mobile Life: The Realistic Scenarios" tries to answer the following questions:

- What are the current and emerging mobile technologies?
- What are the expectations, both in the consumer and enterprise domain, from wireless applications?
- Which wireless applications are going to be the revenue drivers of the future?

As the immediate interface with consumers and wireless devices will increasingly face the challenge of integrating functionality and portability. Devices will become easier to operate, support more colourful screens and sport greater storage capacities. As Internet accessibility becomes a core consumer demand, enabling software, such as hybrid browsers, gateway and server softwares and content transformation softwares will play a larger role in integrating the wired Internet and the wireless mobile worlds.

The future of wireless communication technology will be a combination of 2.5G/3G and WLANs, a shift away from the prevailing 2G infrastructures. WLANs will be the preferred technology in public hotspots and 2.5G/3G will be used beyond that range. The key challenge would lie in seamless integration of the two.

As far as customer needs are concerned, there will be a rising demand for personalisation, localisation and instant connectivity, in addition to the existing needs of ubiquity, security and convenience. Moreover, the mobile medium is likely to remain a voice-driven one. The highest revenue potential is likely to lie in the following six applications, of which only one or two will emerge as 'killer applications':

- Messaging services (SMS and MMS);
- Location based services;
- mCommerce;
- Wireless enterprise solutions;
- Wireless gaming; and
- Wireless financial services.

With the huge development and deployment costs of 3G wireless communication technologies, the survival of the wireless industry will depend to a large extent on successful marketing of revenue-generating killer applications over the next 2-3 years. Though multimedia messaging and mobile gaming are being portrayed as the next big thing, their value propositions are somewhat hazy and their market adoption is going to depend on significant marketing push. Three areas likely to emerge as the natural successors to SMS, as the next generation of 'mobile killer applications' are:

- On the consumer front, wireless financial service offerings; and
- On the enterprise front, mobile office and 'mobile assets' management (MAM).

The adoption of these applications would, however, depend to a large extent on consumer perception of value-addition and enterprise perception of benefits exceeding costs. Western Europe, especially Switzerland, is expected to be a trendsetter in mobile financial services applications, while also being a key market for the enterprise applications. Success of MAM in Europe would, however, depend upon availability of a cross-EU standardised wireless network infrastructure.

MOBILE TECHNOLOGY: CURRENT AND FUTURE

Wireless communications is growing at a rapid pace around the world. In 2001, all major regions recorded annual growth in mobile subscriber base of about 15%, except the North American market, which grew by 9%. By April 2002, mobile phones had overtaken fixed lines in almost 25 countries and the number of mobile subscribers worldwide had crossed 1 billion.

Switzerland's annual per capita expenditures on telecommunications, at EUR 1,485, is higher than that of EU, US and Japan and also much above the Western European average of EUR 820 per year. Mobile telephony comprises 30% of this telecommunication market, while fixed lines comprise 54%. The other data transmission, leased line and cable services are relatively less important. In mobile telecommunication, market penetration doubled from 1999 to reach 74.8% at the end of 2001. But growth rate in this segment had tapered off by the middle of 2001. Given this scenario, the thought starter,
"Mobile Life: The Realistic Scenarios", looks at the following issues for the Swiss mobile telecommunication market:

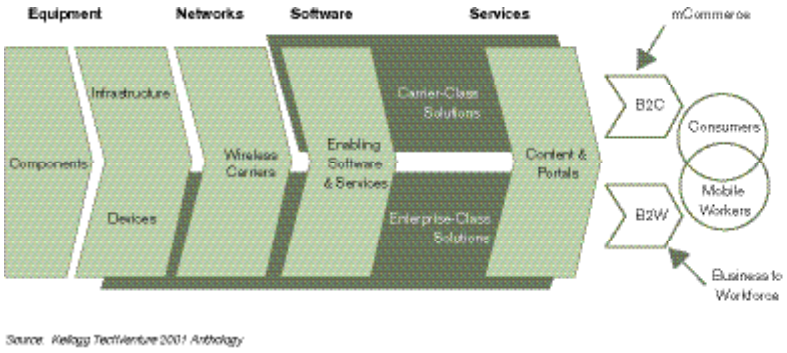
- What are the current and emerging mobile technologies?
- What are the expectations, both in the consumer and enterprise domain, from wireless/mobile applications?
- Which mobile applications are going to be the revenue drivers of the future?

MOBILE TECHNOLOGY

The mobile world is fraught with technological challenges that are mind-boggling. Analysis of the value chain, as depicted in Figure 1, shows several complex issues that need to be addressed, such as:

- Multiple devices, from PDAs to cell phones – with varying screen sizes, must be supported;
- Different networks, supporting various standards, languages and protocols, must be integrated;
- Diverse methods of Internet access, from dial-up to DSL, all must be accommodated; and
- Overlying all this is the need to integrate security into all aspects of the mobile world.

Figure 01: The value chain in the mobile industry



Source: Kellogg TechVenture 2001 Anthology

Thus, the key components of the value chain, which will have a critical role to play in existing and future developments in the mobile world, are devices, wireless communication networks and enabling software. This chapter looks at the current status and outlook for each of these areas, and also outlines the key challenges that lie ahead.

Device-related technology

As seen in the value chain above, devices are the first interface between user and service provider and are, as such, of great importance.

Current scenario

Cell phones and personal digital assistants (PDAs) are the mobile devices, which have been widely adopted by consumers around the world.
Cell phones today are sleeker, have more compact but powerful batteries and are designed to support a wide variety of applications, from text and picture messaging to mobile gaming.

In PDAs, iPaq is now the mobile device of choice and was the platform for almost all new services launched in 2001. Gartner-Dataquest forecasts end-user spending on PDAs, worldwide, to increase 20% to $4.6 bn in 2002.

The PC is emerging as a personal server that supports a user's mobile devices, often through its wired Internet connection. For example, SimpleDevices downloads audio content to the PC based on user preferences. It then transmits the audio files wirelessly to the user's car when it is within range. Although it cannot support real-time news, it does offer a virtual broadband connection to the car and lets users specify desired audio content through the PC's full-screen user interface.

Challenges and Outlook

The main challenge would be in developing devices with instant and easy access to the worldwide web. From 2002, web-enabled phones are likely to become the standard mobile devices in Western Europe. The other main category of devices would be the communicators, PDAs equipped with or linked to mobile phones. Nokia is leading the way in this, having recently launched the Nokia Communicator in Europe and U.S. They are expecting the market for convergent phone/ PDA devices to reach 7 mn by 2005.

The second key challenge would be to accommodate more information on the device screens without losing the core proposition of mobility. Other challenges would include meeting increasing consumer demand for ease of use and reliability, albeit at reasonable prices.

In terms of outlook, the market will continue to shift towards devices with colour displays, more powerful processors and increased storage capacity. Moreover, the distinction between PDAs and consumer electronics devices is expected to blur, over the next three years, as phones, with integrated mp3 and video players, are introduced into the market.

Wireless communication technology

The next link in the wireless communication value chain is wireless communication or network technology. Network technology can be "bucketed" into two main categories:

- Wireless LANS (WLANs)
- Mobile WANS (2G, 2.5G, 3G)

WLANs

WLANs provide local mobility and a simpler alternative to cabling at LAN-like speeds.

Current scenario

Basic WLAN architecture comprises a wireless access point (AP) or base station and a client network interface card for the user's laptop, PDA etc. The network can cover a distance of up to 90 ft (5GHz systems) or up to 300 feet (2.4GHz systems). WLANs are increasingly becoming the popular choice in communication technology in public hotspots.

Challenges and Outlook

WLAN deployment can be impeded by fears of potential lack of management control and security vulnerabilities. Other challenges include interference in the 2.4GHz range, which is already cluttered by 802.11b, HomeRF, Bluetooth, cordless phones, microwave oven emissions and baby monitors. This is particularly an issue for multi-tenant office buildings, where the LAN of one company might interfere with that of a company next-door.

As the industry moves to the uncluttered 5GHz band, most of the above problems are expected to be solved but market development will depend upon availability of APs for equivalent coverage in Western Europe. Another issue that may inhibit WLAN technology growth is the lack of uniform standard, both for technology and spectrum.

In terms of outlook, the following is being expected for WLAN technology:

- 2002 will be a year for planning by vendors and users of WLANs.
- Prices will face downward pressure, presumably to increase penetration.
- 802.11b LANs are expected to proliferate in enterprises and possibly homes and public hot spots.
- Residential wireless LAN packages, offered by broadband last-mile carriers, will emerge.

The market expectations for WLANs until 2004 are shown in Table 1.

Table 01: Aggregate shipments and revenues, 802.11b and 802.11g WLANs

MARKET FIGURES	2002 (E)	2003 (E)	2004 (E)
Shipments (000)	7586	6277	6839
Revenues ($M)	681	524	275
% Revenue change from previous year[1]	-14%	-23%	-48%

1 The negative growth in WLAN revenues is due to an extremely high base reached in 2001.

Source: Cahners In-Stat/MDR, 2001

Mobile WANs

Mobile WANs provide wide-area mobility, voice and data connectivity for global roaming facilities. They have slower speeds than WLANs but more ubiquitous connectivity. The mobile WAN technologies discussed in this section include 2G, 2.5G and 3G.

Current scenario

The prevailing infrastructure is 2G, which involves digital phone systems and circuit-switched, "PCS" services. The maximum speed supported is 19.2K, while most are less than 14.4K.

In Western Europe, the most immediate successor of 2G is 2.5G. It is a digital, packet-switched (always on) system, which does not require carriers to acquire a new spectrum in order to deploy. Network speeds start at about 30 Kbps in this case.

The technology that is expected to revolutionise the wireless world is 3G, expected to be deployed in most countries of Western Europe by 2004-05. It is a digital, packet-switched network, with speeds of 384 Kbps to 2 Mbps. Carriers are required to acquire new spectrum, to the tune of billions of dollars, in order to be able to deploy 3G. Initial spectrum acquisitions are mostly complete worldwide.

Challenges and Outlook

In case of 3G, spectrum deployment costs could make services prohibitively expensive, while standards wars could fragment the market. Billing models/compelling service packages need to be ironed out in a scenario, where – consumers are not used to paying by the megabyte. Moreover, with new technologies being available only in stages, 3G may be pre-empted by WLANs, especially in public hotspots.

Most major telecommunication service providers are expected to roll out 2.5G/GPRS services in 2002. No 3G rollouts are expected in Europe and U.S., this year, in view of the continuing economic slowdown. Business customers will spend the year largely educating themselves and developing mobile strategies for their internal users and mCommerce. 2002 is not likely to be the year of 3G or even 2.5G. While 2.5G is expected to start taking off by the end of this year (refer Table 2), mainstream 3G will still be a thing of the future.

Table 02: Mobile handsets produced world-wide (in '000s)

TECHNOLOGY	2002 (E)	2003 (E)	2004 (E)	2005 (E)
2G (CDMA, TDMA, GSM)	417,612	366,521	174,779*	30,040*
2.5G (GPRS, EDGE, CDMA 1XRTT)	67,715	256,354	570,947	844,434
3G (WCDMA, CDMA2000)	49,349	54,381	62,032	72,672
Worldwide total	**534,676**	**677,256**	**807,758**	**947,146**

*Projected number of CDMA-based 2G phones to be produced in this year is 0.

Source: Cahners In-Stat/MDR, 2001

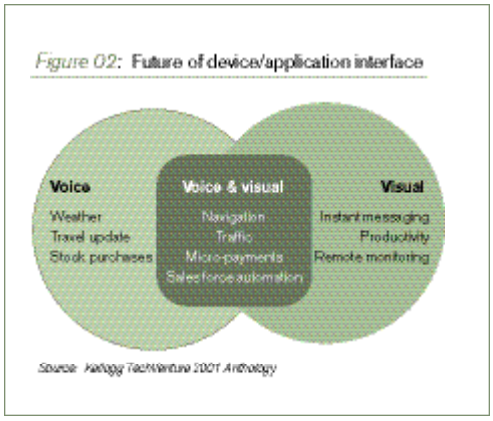
Enabling software technology

The key demand from consumers and businesses is going to be integration of the wired and wireless worlds. Despite the economic slowdown, the forecasts for mobile-Internet usage is very optimistic. A new study by Accenture projects the global market for wireless Internet-capable devices is projected to grow to 1.7 bn mobile connections in 2005.

Thus, enabling software, integrating the mobile world with the Internet, is going to be the third critical link in the chain. These would include embedded browsers, content transformation software, middleware, as well as gateways and server software.

Embedded Browsers

Embedded browsers are technology that is built into a device by the hardware manufacturer that provides access to applications or content.



Current scenario

Most wireless devices will come with an embedded browser from 2002. While PDA browsers have been designed to support HTML, cell phone browsers, primarily WAP-based, use XML/ WML. This can limit cell access and must be designed specifically for the mobile Internet or transcoded into WAP by a transcoder.

Challenges and Outlook

The wireless world will stay primarily voice based. Voice related technologies are becoming critical in wireless applications and services. The human voice is the most universal and accessible of all browsing interfaces – one that has no learning curve, is standardised and can be used to access any content or services.
The key challenge would lie in developing hybrid browsers, which integrate voice recognition technologies with standard browsing functionality.

Gateways

'Gateways' are another key enabler in integrating the Internet and the wireless world. They connect wireless users seamlessly to the Web.

Current scenario

Gateways help in connectivity across a diverse set of wireless and wired networks to enable TCP/IP applications to seamlessly access enterprise networks. It helps to provide security for communications and improve the performance for mobile computing applications. An example of this is IBM's SecureWay Wireless Gateway.

Gateways now mostly support full 128-bit WEP encryption keys and NAT (network address translation), which is a firewall-like service that masks internal machines by assigning them private addresses.

Challenges and Outlook

The challenge would be to build wireless gateways that support multiple devices from various wireless networks. Technological challenges remain in the use of TCP/IP protocol for communications. This generates a lot of redundant data, such as acknowledgements and handshakes, to deliver the actual data, which lowers data throughput leading to increase in response time from users and network congestion.

Content Transformation Software

Companies that have invested in web technologies and infrastructure hope to extend browser-based access to wireless users. In this, content transformation software is going to become critical.

Current Scenario

Transcoders transform and customise content into usable format for a wide variety of wireless devices. HTML web content is meant for larger screens on PCs, and is difficult and cumbersome to transcode, leading to poor user experience. Most developers currently rely on XML.

Challenges & Outlook

Vendors are trying to develop a better solution than XML in transcoders. Beyond transcoding, development of middleware to integrate mobile and enterprise applications is going to be a key challenge. Middleware will facilitate complex functions such as mobile transactions.

Wireless servers

These provide a bridge between the wireless world and a company's enterprise applications. According to experts at PricewaterhouseCoopers, they offer several important features, such as:

- Diverse wireless device support;
- Device/ network speed detection;
- End-to-end security and reliable transmission; and
- Intermittently connected device support.

Current status

In 2001, dozens of start-ups were working on wireless enabling software that would allow customers to make purchases from a cell phone, browse ads and merchandise from a mobile device and respond to promotions. Poor response from the market and the economic downturn squashed many of these plans. However, several critical applications continue to be delivered. 2Roam found success in installing its mobile servers behind the firewalls of companies, such as eBay, allowing it to serve wireless users.

Challenges & Outlook

The main challenge in front of wireless server software lies in supporting a wide variety of mobile devices with varying capabilities and power budgets. They would need to provide content matched to device capabilities and in the long run also support transparent switching from one device (static/ mobile) to another (static/ mobile) as per the user's convenience.

In Conclusion:
Wireless devices will increasingly face the challenge of integrating functionality and portability. Devices will become easier to operate, support more colourful screens and sport greater storage capacities. The future of wireless communication technology will be a combination of 2.5G/3G and WLANs, WLANs will be the preferred technology in public hotspots and 2.5G/3G will be used beyond that range. Onus will be on technological developments to facilitate seamless transfer of data and voice between WLAN and 3G networks. Operators may restrict themselves to one field or offer a combination of both, as seen in the case of SK Telecom in Korea. Trendsetters, NTT DoCoMo and KDDI telecom are also thinking in terms of offering a combined package. Enabling software developments will be a key to integrating Internet and the wireless world. These would include hybrid browsers (supporting voice recognition capabilities along with standard browsing facilities), gateway and server software, and content transformation software (transcoders and middleware).

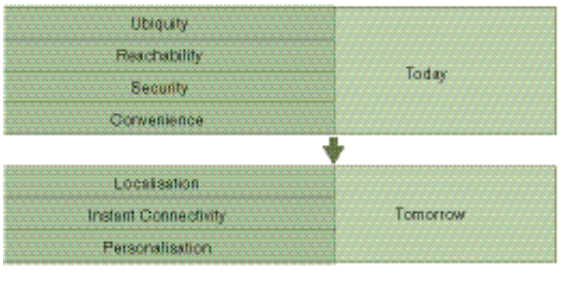
MOBILE NEEDS AND APPLICATIONS: CURRENT AND FUTURE

The basic value proposition of mobile telecommunication is "always on connectivity", information on demand and instant gratification.

EVOLVING MOBILE NEEDS

Customer and enterprise needs in wireless communication are evolving in the following broad directions, as shown in Figure 3.

Figure 03: Primary attributes looked for in mobile communication.



Source: Deutsche

Some of the key needs identified amongst customers of wireless/ mobile services, as they exist today are:

- Ubiquity & reachability: It is one of the most obvious benefits looked for in a wireless device. A mobile device should be able to provide real-time information and communication, independent of the user's location.
- Security: Increasing customer concerns about mobile security has forced many players to design wireless devices, which provide authentication to the owner and enable high levels of security. SIM (Subscriber Identification Module) is anexample of this.
- Convenience: Customers are looking for simple and easy-to-use devices. They are also looking for convenient Internet access.

Consumers are likely to increasingly demand personalisation, localisation and instant connectivity from mobile services

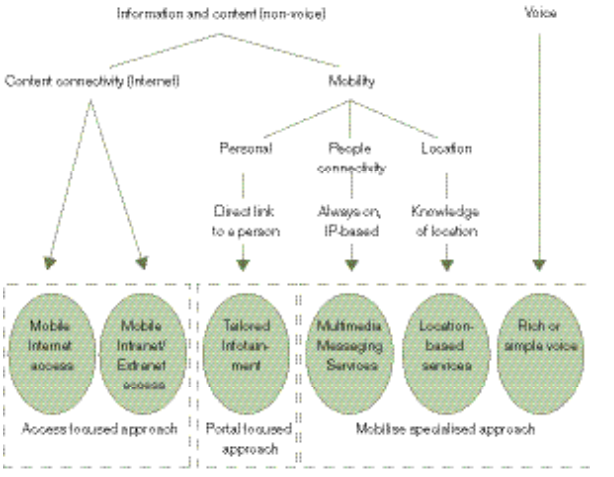
The needs that are likely to evolve from ongoing developments in the wireless industry are:

- Personalisation: The emerging need for payment mechanisms, combined with the availability of personalised information and transaction feeds via mobile portals, will move customisation to new levels leading ultimately to the mobile phone device becoming a real-time tool.
- Localisation: A mobile device should be able to provide information on the physical location of a particular user, which will drive the user's transactions with the service provider. For instance, a businessperson arriving on a plane to Helsinki can expect to receive a message asking whether he/she needs a hotel for the night.
- Instant connectivity from a single device: New wireless devices should be able to provide easier and faster access to information without booting a PC or connecting a call. They should also provide access to all messages (voice, email, multimedia, fax) and corporate networks from one device.

EVOLVING APPLICATIONS

3G and WLAN technology, in conjunction, hold the promise of a variety of services to meet the above needs, which have been shown in Figure 4:

Figure 04: **Mobile services / applications framework**



Source: Telecompetition Inc.

The above services can be offered to consumers, both individual and business, by developing suitable wireless applications. As such, the wireless applications market offers a host of exciting opportunities. There are many players trying to get a piece of this market, where the highest revenue potential will lie in one or more of the following areas:

- Messaging services;
- Location-based services;
- mCommerce;
- Wireless enterprise solutions;
- Wireless gaming; and
- Wireless financial services.

The rest of the chapter looks at these applications in further detail.

Messaging services
In the recent past, the killer application of the mobile world has been Short Messaging Service (SMS).

SMS was targeted at the youth and its 90% use was in mobile-to-mobile transmission. It gained widespread popularity due to its easy-to-understand value proposition and successful standardization of low-cost technology.

The revenues for the SMS market is expected to flatten out worldwide, due to relatively high levels of penetration, to around $6-7 bn in 2003-04 (Source: Mobile Lifestreams). A possible threat to the technology could be from text email systems from Research In Motion, Motient etc., which, however, are more likely to remain niche players due to their high cost.

Challenges and Outlook
Multi-Media Messaging Service (MMS) is being predicted to soon eclipse SMS. MMS, a completely new service using preferably 3G infrastructure, allows users to send and receive messages with full multimedia content. But the value proposition is somewhat hazy in this case – access infotainment and share experiences – with the desire to access and share multimedia over mobile phones not being as clear as the desire to send simple text messages to stay in touch. MMS will bring content providers and a large number of value-added service providers into the wireless space.

The revenue from 3G services is expected to reach $30 bn by 2005, of which MMS may represent $3-4 bn (Source: inCode Telecom Group). In the near term, penetration is dependent on network upgrades, handset penetration and the cost of the service. Initially, Asia Pacific and Europe will dominate, contributing about 40% of total revenues each. Sales in North America is expected to pick up and at least equal Europe as the technology is likely to appeal to "performance-spoiled" Americans.

Location Based Services
Location-based services (LBS) is the convergence of three technologies – the Internet, wireless communications and mobile positioning. Calling a taxi at the airport without knowing the local number, finding an easier access route or getting the closest parking space available – LBS promises all these and more. It is essentially different from Internet services in that it uses the current location of a wireless device, and hence its user, in delivering the service.

The emergence of LBS was initially driven more by government regulation than by market demand. According to a report by inCode Telecom Group, the value proposition for the average customer, however, is strong, based on:

- Personalisation: The location information can be used to filter and personalise Internet content, without the user having to spend effort on profiling. This solves the service provider's problem of users finding it inconvenient to enter data through mobile devices.
- New services: LBS can be used to provide completely new services that fall into the following categories:
  - Pull services: User-driven location services, enabling the user to determine the location of a person or a physical object and guide him/ her to that person or object.
  - Push services: Event-driven LBS, where the user receives a notification on the basis of his current location or movement.

Challenges & Outlook
The growth of LBS may be hampered by any or all of the following limiting factors:

- State of development of location determination technology, which can be handset-based, network-based or hybrid. The first, such as GPS, is unattractive to wireless operators as it eliminates potential revenues from location information provisioning but it provides position granularity of about 30 meters. The second option puts location data provisioning in the hands of the operator but the trade-off is worse granularity. The hybrid approach is considered the best. It utilises GPS and network-based technology, such as E-OTD, and can achieve better granularity than the pure-handset approach.
- No proven business models. It is not sure if users are likely to pay a premium for LBS, which is a costly service for operators to deploy.
- Privacy and security issues. This would be a top consumer concern and would involve barring of third party access to all positioning requests and responses.

Revenues for LBS service providers may either come directly from end-users or indirectly by providing access to third parties for advertisements etc. The second option is deemed more likely in view of the fact that LBS is expected to mirror today's Internet environment where few sites are being able to charge for what they offer.

LBS is being predicted to become the most popular value-added wireless service, both in U.S. and Europe, in the long run. Its revenues are predicted to reach $11 bn worldwide in 2005, according to Kelsey Group estimates. Though, in case of continued economic slump, the figures are likely to be much lower.

mCommerce
telephones, pagers, personal digital assistants (PDA), and handheld computers. Players in this arena include wireless service providers, mCommerce aggregators and e-tailers who offer their products over wireless.

Consumer demand for mCommerce services has been low till date. Some product categories, such as CDs, books, flowers, gifts, tickets, movies are believed to be more conducive for mCommerce. Currently the mCommerce market is most developed in Japan, where NTT DoCoMo is the largest service provider.

Challenges and Outlook
The development of a market for mCommerce may be adversely affected by concerns about security of transactions. But this is likely to be mitigated over time. The more important hurdle is the small screen of wireless devices, which detract from user experience and make viewing products, especially big-ticket items, such as consumer durables, more difficult. The challenge would be in converting investments in infrastructure, applications and services into sustainable businesses.

On the consumer front, the definition of mobile commerce has been too narrow in its focus on transactions. In the long run mobile commerce will create life style altering solutions. The applications which may gain popularity with consumers in the near term, include:

- Mobile retailing;
- Mobile ticketing;
- Mobile auctions; and
- Mobile reservations.

It will, however, be enterprises, and not consumers, who will drive mobile commerce. For businesses, mCommerce will pave the way to cut costs, generate revenues and gain efficiencies.

Revenues from mCommerce are expected to grow from 1% in 2001 to 15% of projected online revenue in 2005 ("Mobile/ Internet Wireless Data, March 2001"Merrill Lynch). By 2004, the number of mCommerce-enabled subscribers is projected at 212 million. Asia is likely to be the biggest market, followed by Western Europe. Total revenues from this segment may grow to $22.2 bn by 2005 (Ovum Research).

Wireless Enterprise Solutions
Broadly defined wireless enterprise applications provide remote access to corporate data, such as sales, contact, product information and corporate network files, via handheld devices.

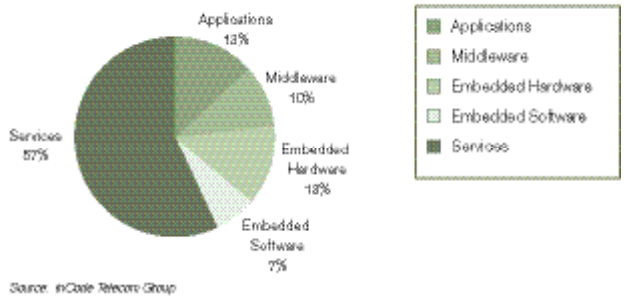
Three types of applications are required to extract corporate data:

- Vertical applications to extract data from corporate networks wirelessly and format the data for wireless device display;
- Horizontal applications such as ERP, CRM and sales force automation; and
- Middleware or support applications to provide additional functionality to the other two, and also provide security, interactivity and multiple access methods.

Challenges and Outlook
Though the demand for Wireless Enterprise Applications will be driven by ROI (return on investment) and state of the economy in the short run, other limiting factors may be inability of devices to support WAP-based browsers, unavailability of packet switching technologies, problems in integrating IT and wireless infrastructures and security issues.

Merrill Lynch, in its report "Mobile/ Internet Wireless Data, March 2001", projects the total number of mobile Internet-enabled professionals to equal 19 million by 2005. To support this level of Internet-enabled enterprise subscribers, five segments within Wireless Enterprise Applications (services, applications, middleware, embedded hardware and embedded software) will experience rapid growth. Total worldwide market opportunity for wireless enterprise applications is expected to be around $15 bn in 2005, excluding fees for airtime and devices, of which, applications alone would account for around 13% or $1.95 bn, as shown in Figure 5.

Figure 05: Break-up of wireless enterprise applications revenues (E) in 2005



Source: mCode Telecom Group

Wireless gaming

According to Datamonitor, mobile games are the next Internet goldmine due to their mass-market appeal. They are strictly for entertainment and luxury rather than a necessity. The market for this is being led by Japan, where 52.5% of mobile use is for entertainment. I-mode games offered by Japanese companies, such as NTT DoCoMo, is more advanced than WAP-enabled ones.

Challenges and Outlook

The development of this market would be hampered by small monochrome screens, low connection speeds, high battery consumption for graphical games, high access time costs and lack of flexibility in pricing structures, especially in the U.S.

70% of the wireless gamers worldwide are likely to be teenagers and young adults, using prepaid accounts. The market may take off as and when large-scale deployment of 2.5G/ 3G-based broadband networks happens. The market in Europe and U.S. is expected to grow from virtually zero now to $6 bn in 2005, split 60/40 in favour of Europe, as per estimates by Datamonitor in 2001. Conflicting U.S. standards and lack of flexibility in pricing structures is likely to relegate U.S. to the back seat, at least in the short run.

Wireless financial service offerings

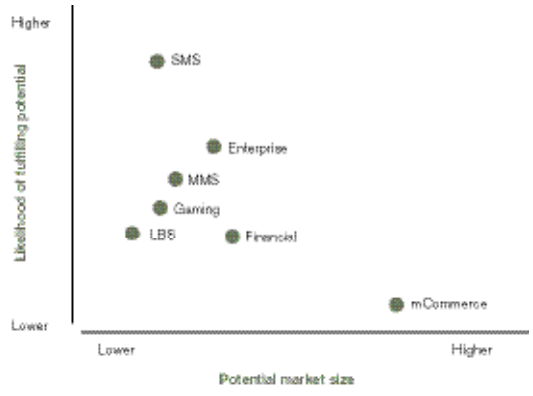
Wireless banking, stock trading and investments constitute the financial services applications most likely to gain popularity over the wireless medium. Mobile financial services are looked at by financial services firms as a strategy to retain customers and not generate revenues. The biggest scope lies in real-time applications, such as stock trading – which currently supports a smaller base of active investors but will gain broader application and adoption over the long term.

Challenges and outlook

Existing wireless infrastructure architecture is not designed for data-driven applications, which can hamper development of mobile financial service offerings. Move to a packet-based architecture, such as 3G, will provide the bandwidth needed to satisfy user performance requirements.

Limitations also exist in the application/user interface due to the small size of mobile devices. Other limiting factors can be security concerns and popularity of substitutes, such as the wired Internet and telephones.

Celent Communications predicts that 5.2% of the North American population (13.5 mn), 20% of Asians (56 mn people) and 70% of Europeans (250 mn people) will use wireless financial services by 2005. Frost and Sullivan predicts revenues will grow to $17.55 bn worldwide by 2005, Europe and the Pacific Rim being the biggest markets.



In Conclusion:

Customer needs are evolving towards personalisation, localisation and instant access to the Internet. Six major applications are likely to shape the mobile/ wireless market for consumers – messaging (SMS & MMS), LBS, mCommerce, wireless financial services, mobile gaming and enterprise solutions. Of these, LBS and mCommerce are more likely to be enterprise-driven in the short run.

These applications have been mapped below on a two-dimensional axis, depicting likelihood of fulfilling potential versus potential market size, to gain an overall idea of potential future market scenario.

MOBILE LIFE: THE REALISTIC SCENARIOS

The main costs in any mobile service deployment are that of infrastructure and licenses. A simple analysis of Europe shows that license fees of a total $100 bn have been allocated so far, another $150 bn will be spent in rolling out 3G services. Assuming all current subscribers convert to 3G, this translates to an NPV of $1900 per subscriber, for the carriers to just break even for 3G-rollout technology.

Even if the revenues from wireless applications reached $ 100 bn per year within five years, the carriers' operating income of that application will contribute just 4.5% towards the net capitalisation of 3G rollout expenses. Thus, recouping the remaining 95.5% of capital expenditure would have to depend to a large extent on share of revenues from wireless applications, developed and popularised over the next 3-4 years. Thus, payoff will only happen from possible "killer applications", making such applications the main drivers of success in the mobile world.

Several interesting trends are predicted for the wireless applications market, as discussed below:

- Applications that bog down users will face extinction.
- Younger tech-savvy users are likely to be the key pushers of data.
- Mobile users are more likely to do those transactions which have low navigational overhead and very limited context.
- Data transfer applications may rise, given packet switching technology.
- Applications that are not foreseeably profitable will have no future.

Given the above trends based on consumer requirements and technological developments, three mobile applications are likely to emerge as 'killer applications" over the next three years:

- On the consumer front, other than the already popular messaging applications, wireless financial service offerings will be the main value driver.
- On the enterprise front, mobile office and mobile asset management are likely to be big revenue generators.

WIRELESS FINANCIAL SERVICES

Wireless financial service offerings of the future should be simple to operate, highly focused and require little time to navigate. Tremendous growth is expected in this area as wireless financial services help consumers in removing latency in assessing financial information and do away with the hassles of sitting down at a PC. Financial services have been the early adopters of mCommerce for several reasons:

- The time and location-sensitivity of mobile devices and networks provide significant value in delivering time-critical information and executing capabilities to the user (buying and selling stocks).
- The consumer is given the opportunity of doing simple chore-driven financial transactions (bill payments and account transfers) during downtime, such as waiting for a plane or train.
- Mobile devices are easy to use to make payments to retailers etc.

A Bank of Montreal study revealed most users go on air to accomplish specific tasks quickly. The main market for mobile financial service solutions is likely to be affluent, technologically savvy, on-the-move people. But the services, themselves, have to move forward from being just an extension of web offerings.

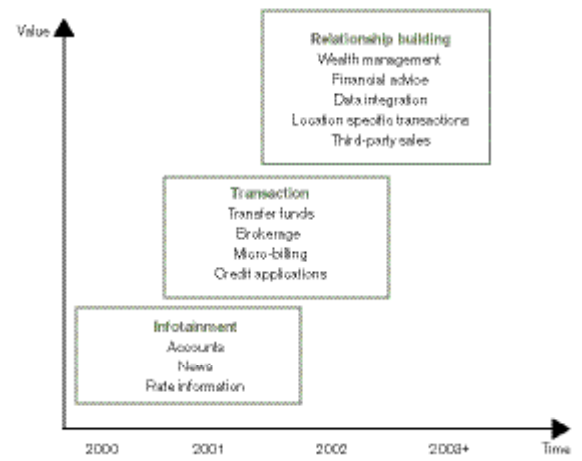
Europe is likely to lead the way - as banks and other financial services institutions there have been quick to incorporate mobile solutions. Though consumer adoption has been slow, banks have seen this as a strategic extension of services. By 1999, 90% of banks in Western Europe offered some form of mobile banking service, such as access to account, credit card balance or interest rate information. Over the past few years banks have also started offering other more complex transactional capabilities, such as bill payment, fund transfer, PIN changing and credit application.

Current & Future Services

Figure 6 shows the development of financial services applications, based on the mobile medium. From infotainment and transaction based services the shift is towards relationship-building ones.

Retail brokerage is the most mature of these services. Initial offerings in this area were stock quotes, stock charts, news clips and alerts, and account information. It was one of the first killer applications in this area. With increase in ability to offer secure transactions, there has been a move towards stock and options trading and account management. 20% of online trading in Japan is already happening via mobile phones. In

Figure 06: Developing financial services applications



Source: Kellogg TechVenture 2001 Anthology

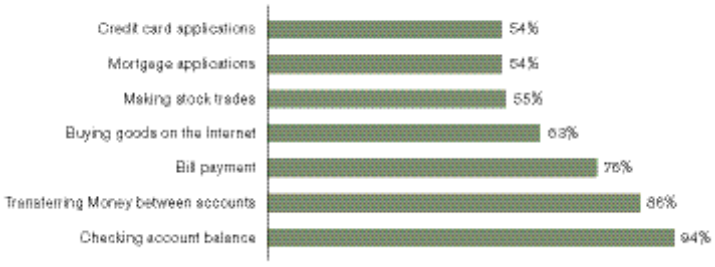
Europe, too, nearly all the brokerage houses currently offer mobile services.
Investment banks are likely to continue use of mobile commerce, both as a productivity tool for their employees and a value-added service for institutional and individual clients, in order to stay in touch with global markets at all times.

Widespread use of wireless banking and brokerage should be followed by other sectors, such as insurance, mortgage, consumer loans, financial advice and credit cards beginning to take to this market. Some of these players can become “mobile concierges”, providing integrated financial, travel and credit card advice, generating tremendous cross-selling opportunities.

Mobile payment applications are still in their infancy – with no solution having gained critical mass of users and establishing itself as leader. A concept showing considerable promise is that of mobile cash, which is the use of a wireless device to load cash onto a mobile device, typically into a smart card. Telecom companies, such as NTT DoCoMo and Sonera, and credit card companies, such as Visa and MasterCard, are building micro-billing and ‘electronic wallet’ businesses. Two such services include PayPal and Remit.com, which enable individuals and businesses to transfer cash to each other from banking or credit card accounts.

Figure 7 shows the level of interest among consumers in using mobile phones for specific financial transactions.

Figure 07: Level of interest among consumers in using mobile phones for financial services



Source: Gallup Global Survey, 2001

Application Drivers
The market for wireless financial services applications would be driven by the following:

- Increasing use as a customer retention tool. Financial mCommerce will progress from being a simple informational and transactional tool to being an integral part of streng thening customer relationshipsm through value-added problem solving and financial solutions. A recent Forrester Research in 2001 found that 70% of banks and brokerages ranked wireless service as one of the key components of their overall strategy for the next two years. The slump due to economic slowdown is going to be a period to consolidate and integrate for these financial services institutions.

- Emerging “suite of killer apps”. In this field, instead of one or two killer applications, there is going to be “suite of killer apps”. Personalisation will be the main driver of customer loyalty by increasing switching costs.
- Integrating wireless with other delivery channels. Mobile financial services are a time sensitive location-independent service, which can save a customer the time of going to an ATM or nearest bank branch. Financial institutions are likely to use the wireless channel to selectively drive traffic to other channels for more information-heavy content. The mobile medium will provide significant opportunities for cross-selling and improving customer experience.
- Non-finance companies entering the sector. Mobile network operators who have an existing relationship can use these to cross-sell financial solutions to customers. Wireless services leader, NTT DoCoMo in Japan charges a 9% fee for all goods and services purchased through I-mode. It is also offering micro-billing services that generate fees of 5-15% of transactions. PayPal, started as a person-to-person e-payment service in the U.S. in 1999, now allows transactions over the wireless medium, as well. Execution costs at a few cents per transaction makes it cheaper than credit card payments.
- Firms partnering across the value chain. As the initial development and deployment costs are going to be very high, firms will seek to partner and form alliances. For instance, Ericsson and IBM are joining forces to deliver financial solutions over the wireless networks. Barclays Bank and BT Celnet are offering secure wireless financial transactions in U.K.

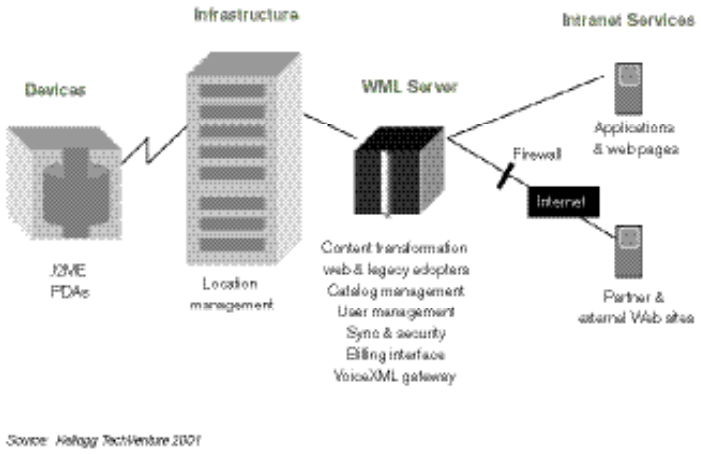
Mobile Office

Widespread usage of wireless applications in the enterprise will happen as and when the benefit derived from employee access to instant information clearly exceeds the installation and operational costs of corporate wide wireless networks. Push for instant information at fingertips is soon to be recognised by corporate environments. This will take the form of extension of corporate information available on PCs to mobile handheld devices, which employees can carry outside to a meeting in order to be connected real-time to corporate intranets.

Current & Future Services

The main value-proposition of mobile office applications is instantaneous and ubiquitous access to business-critical corporate data by white-collar workers. This is primarily a productivity enhancement tool, which will provide end-to-end solutions that meet mobile data bandwidth, availability and security needs.

Figure 08: A typical mobile office architecture



Source: Kellogg TechVenture 2001

The major services in this area are likely to be:

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

Application Drivers
The developments that are likely to drive future growth of this application include:

- Mobile handheld devices with sufficient presentation area and voice-dialling capability;
- Protocol and software for instantaneous transmission of intranet data to wireless platform;
- Low cost wireless carriers (WLANs 802.11 within building and cost effective 2.5G/ 3G networks outside corporate LAN area) and seamless transmission between protocols and carriers;
- Middleware to allow translation of data between the different LAN protocols and allow switching from WLANs to 3G;
- Smart network architecture for enterprise information systems and intranets, where data and application will reside in nodes of the corporate data network; and
- Perception of constant access and declining costs among enterprise customers.

MOBILE ASSET MANAGEMENT

The two main value drivers in the wireless space are mobility and time sensitivity, which cannot be efficiently implemented in the existing wired platform. The value of wireless applications in logistics will come from efficiently managing assets that are mobile. Hence the name mobile asset management (MAM). For instance, a trucking company that can track the location and capacity utilisation of its trucks can easily re-deploy or re-route its fleet to improve utilisation and offer improved customer service. This is a typical example of location and time-sensitive situation and a perfect opportunity for wireless deployment.

Current & Future Services
Forrester research estimates the total worldwide corporate expenditure associated with managing material and product flows in the vendor-to-customer supply chain at $2 tn in 2000. These expenditures pertain to the entire value chain associated with the product and include inbound freight, customer service, administration and information system costs.

Administration and information system costs associated with managing the global supply chain average 7-10% of total expenditure. Enhanced electronic management of external inter-enterprise information flows can reduce these costs by up to 20%. This would put the cost savings associated with Enhanced Value Network communications at around $28 bn.

MAM applications can be divided into three broad categories:

- Location based services: Help in tracking information when the freight (finished goods/ inventory) is enroute, as used by FedEx and other courier firms in their logistics management.

- Telemetry: Aid transporters in automatic vehicle location, that is in graphically mapping a fleet of trucks, across widespread geographical areas.
- Field sales and services: Lead to better customer relationship management, as with always-on-connectivity, the sales force can be constantly in touch with customers.

The basic value propositions of MAM are:

- Context sensitive information available anytime anywhere;
- Application-based user choice of synchronous or asynchronous information dissemination. (Automatic meter reading will be synchronous use while a travelling salesman's use would be asynchronous); and
- Anytime anywhere capabilities, which make wireless the most efficient tool for executing communications in the MAM industry given its vast geographic expanse.

Application Drivers
The critical success factors for MAM applications are likely to be as follows:

- Scalability of wireless MAM solutions, which will enable growth in a cost-effective manner;
- Productivity and efficiency gains actually realised by firms, which have been leading adopters;
- Infrastructure for connectivity, considering the vast geographic expense of MAM. (Carrier networks or GPS technology may be used in main towns and highways, while in more remote locations satellite networks provide coverage); and
- Partnerships and alliances to share costs of service deployment and leverage individual core competencies to provide end-to-end solutions.

In Conclusion:

The survival of the wireless industry will depend to a large extent on the successful development and marketing of killer applications over the next 2-3 years. These applications will be the main source of revenues for service providers, who have to make substantial initial investments to deploy 3G infrastructure.

Three applications are expected to stand out, in terms of revenue potential, over the next 3-4 years. They are:

- Consumer domain: Mobile financial services solutions;
- Enterprise domain: Mobile office and mobile asset management.

The adoption of these applications would, however, depend to a large extent on consumers' perception of value-addition and increasing benefits to costs in the enterprise environment. The development of network infrastructure, providing greater bandwidth, will also play a key role, in facilitating the marketing of these applications.

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