Deutsche Bank Research

January 15, 2004

No. 42

Economics

Digital economy and structural change

Mobile telephony – cooperation and value-added are key to further success

- Around the start of the new millennium, mobile telephony experienced an unprecedented upswing. The step toward 3G seemed to herald its imminent entry into the lucrative data telephony business. But **soon after the hype, disappointment set in throughout the telecommunications sector**. The bursting of the high-tech speculation bubble spelt the end for many a business idea.
- Today the phase of exorbitant growth in telecommunications is over. Measures such as average revenue per mobile phone user and the penetration rate back this up. The **slowdown will lead to more intense competition**.
- **Fiercer competition for market share, lower share prices, high investment costs and enormous licence fees are a drag on the telecommunications sector.** The industry is currently undertaking a change of strategy. It is scaling back expansion – even where this results in losses.
- The problems currently evident in mobile telephony are leading critics to make overly pessimistic predictions that 3G will never become profitable. However, the resulting calls not to introduce 3G and instead directly back alternative wireless technologies (e.g. WLAN) are a step too far. Ultimately, a profit-oriented service can **only create significant value-added with a mix of both UMTS and WLAN technologies.**
- It is notable that no attractive broadband-dependent applications have emerged as yet. The typical user is **only interested in the value-added the application provides, not the underlying wireless technology**.
- No single killer application will bring about the big commercial breakthrough for broadband mobile telephony alone. **A cross-technology data services portfolio offering significant value-added on a mass scale has the only chance of success**.
- Although mobile telephony remains one of the most dynamic areas of the economy, excessive euphoria is misplaced. **Advanced wireless technologies will not become profitable before the start of the next decade**. But even that is not a given; this will challenge the entrepreneurial spirit of network operators, mobile terminal manufacturers and service providers alike.

Author: Stefan Heng, +49 69 910-31774 (stefan.heng@db.com)

www.dbresearch.com

Editor
Hans-Joachim Frank
+49 69 910-31879
hans-joachim.frank@db.com

Technical Assistant
Sabine Kaiser
+49 69 910-31831
sabine.kaiser@db.com

Deutsche Bank Research
Frankfurt am Main
Germany
Internet: www.dbresearch.com
E-mail: marketing.dbr@db.com
Fax: +49 69 910-31877

Managing Director
Norbert Walter

Mobile telephony – cooperation and value-added are key to further success

Around the start of the new millennium, modern information and communication technologies like the innovative fixed-line technologies (e.g. DSL, powerline communications, broadband cable networks)[1] and especially digital mobile telephony were being hailed as the next big thing. The telecommunications sector as a whole, but the mobile phone segment in particular, experienced an unprecedented upswing. In 1990 there were 10 m mobile phone users worldwide, but by 2003 this figure had already risen to 1.3 bn. The number of mobile phone users in Germany doubled to 48 m in 2000 alone; this rate of technology penetration is historically unique – even when compared to the introduction of radio, television or the internet. During this boom phase, innovations that were supposedly directly marketable provided a further stimulus to business ideas already in circulation. The step from the second generation (2G) to the third (3G) seemed to herald mobile telephony's imminent entry into the big business of data telephony. The public's expectations for the prospects of GSM, GPRS and UMTS were high.[2]

From the very outset the high-tech sector, especially modern telecommunications, has displayed high volatility. After the initial euphoria, the negative reports that followed and the ensuing optimistic tone of recent company results, the future of telecommunications, above all mobile telephony, is unclear at this point. This study outlines the current prospects for modern wireless technologies, focusing in particular on UMTS and WLAN. We cannot restrict ourselves to the purely economic side here; the relevant regulatory and technological aspects are also included.

From high flyer to problem child

The contraction "3G" initially represented a quantum leap in transmission rates. While the usual GSM rate was 9.6 kbits/s, UMTS/3G could offer 200 times that, i.e. 2 Mbits/s (2 m bits per second). Unlike GSM, UMTS does not transmit within strictly established time windows, but uses existing capacity flexibly as a shared medium within a broad wireless cloud.[3] All users transmit within one cell, but thanks to unique identification techniques each user can filter out the data packet meant for him/her alone. But the nature of the shared medium also means that when a UMTS cell experiences intense demand from many users at once (or in a WLAN hotspot), actual transmission speeds fall well below the ideal.[4] Another handicap of 3G compared to 2G is caused by the physics of waves. Waves in the GSM frequency range can penetrate panes of laminated glass (as found in railway carriages) more easily than UMTS waves. The quality of UMTS transmission is thus likely to be generally poorer in trains than marketers had hoped.

Glossary

2G, 3G, 4G	2nd, 3rd and 4th generation of mobile telephony
ARPU	Average Revenue Per User
BITKOM	German Association for Information Technology, Telecommunications and New Media
CDMA	Code Division Multiple Access
DSL	Digital Subscriber Line
EDGE	Enhanced Datarates for GSM Evolution
ETSI	European Telecommunications Standards Institute
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communication
HSCSD	High Speed Circuit Switched Data
HSDPA	High Speed Down-Link Packet Access
IBFN	Integrated broadband telecommunication network in Germany
IEEE	Institute of Electrical and Electronics Engineers
IMT	International Mobile Telecommunication
IPSec	Internet Protocol Security
LBS	Location Based Services
MMS	Multimedia Messaging Service
MO-WLAN	Mobile Operator Wireless Local Area Network
PDA	Personal Digital Assistant
PLC	Powerline Communications
SMS	Short Message Service
TDMA	Time Division Multiple Access; synonym: USDC
TD-SCDMA	Time Division Synchronous Code Division Multiple Access
UMTS	Universal Mobile Telecommunication System; synonym: W-CDMA
USDC	US Digital Cellular System; synonym:TDMA
WAP	Wireless Application Protocol
W-CDMA	Wideband-Code Division Multiple Access; synonym: UMTS
WEP	Wired Equivalent Protocol
WLAN	Wireless Local Area Network

[1] For a discussion of powerline and cable networks see Heng, Stefan (2003): Germany's broadband networks – innovation on hold, in: Deutsche Bank Research, E-conomics No. 35, Frankfurt a.M.

[2] While European and some Asian states have agreed on UMTS, the USA and China are to adopt CDMA2000 and TD-SCDMA respectively. All three transmission technologies are based on the IMT2000 standard.

[3] All users of a radio cell access the entire frequency spectrum available.

[4] For a discussion of limitations on transmission capacities see Heng, Stefan (2001): 3G – chance for take-off in mobile business, in: Deutsche Bank Research, E-conomics No. 20, Frankfurt a.M. p. 3f.

Despite the possible technical limitations, UMTS outwardly presented itself as the key to the lucrative broadband data communications markets of the future.[5] To telecommunications companies and service providers, it held out the prospect of unbroken growth. As would be expected with such excellent prospects, bidding for 3G licences was intense. The awarding of 3G licences in Western Europe poured EUR 140 bn into state coffers. The German and British auctions alone realised EUR 51 bn and EUR 38 bn respectively. In Germany, apart from the four already established GSM network operators, two newcomers also acquired the contract. This raised hope that competition in mobile telephony would intensify further in the future.

Euphoria ends in telecommunications sector

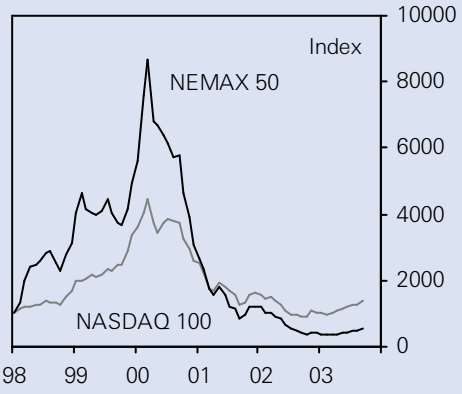
But soon after the hype, disappointment set in throughout the high-tech sector, especially in mobile telephony. Sentiment, formerly so positive, now swung just as strongly toward the negative. The bursting of the high-tech speculation bubble[6] spelt the end for many a business idea spawned in the spirit of the burgeoning new economy. The forecasts for 3G were revised fundamentally and the future of the whole telecommunications sector was cast in a very gloomy light.

For telecommunications companies in the highly developed industrial countries, the phase of exorbitant growth is over. Measures such as average revenue per mobile phone user (ARPU) and mobile telephony penetration provide impressive evidence of this. ARPU in Germany has stagnated at EUR 25 per month. Mobile penetration is increasing slowly at a mere 4% yoy. The slowdown will inevitably lead to more intense competition in mobile telephony. Growth will be achieved mainly by squeezing out competitors. Today's estimates of business potential are far more conservative than those of a few years back. 3G will have generated less than 10% of total turnover in mobile telephony by 2006. Gloomy prospects, share prices' massive falls from their former peaks, high investment costs and enormous licence fees are a further drag on the ratings, and thus the refinancing, of telecommunications companies already heavily burdened with debt.

Meanwhile, some German telecommunications companies are valuing their 3G licences at less than half the price originally paid. To drive forward the launch of 3G in this critical situation, national regulators are looking for new ways to interpret the established contract. France took the dramatic step in October 2001 of retroactively sinking the licence fees payable from EUR 9.9 bn to EUR 1.2 bn. Many European telecommunications companies are currently undertaking a significant change of strategy. They are concentrating on familiar markets, scaling back expansion, even booking losses. For example, apart from in Italy, where the issuing conditions were retroactively changed in August 2003 to allow licence trading, companies in countries like Germany, Austria and Switzerland returned their licences without compensation.

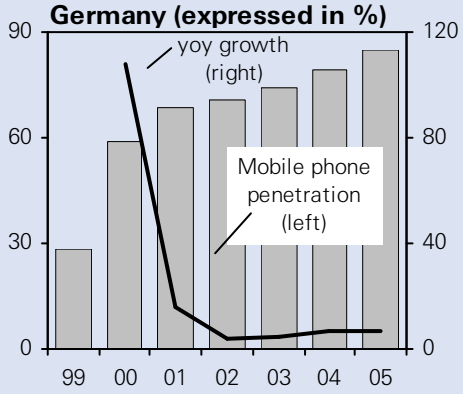
The new mobile technologies hold out the prospect of great efficiency gains, but still struggle with issues blocking their success. Apart from the difficulty of producing enough mobile terminals and the delays in network construction, inadequate standardisation is also hindering the progress of broadband mobile telephony.

NEMAX & NASDAQ



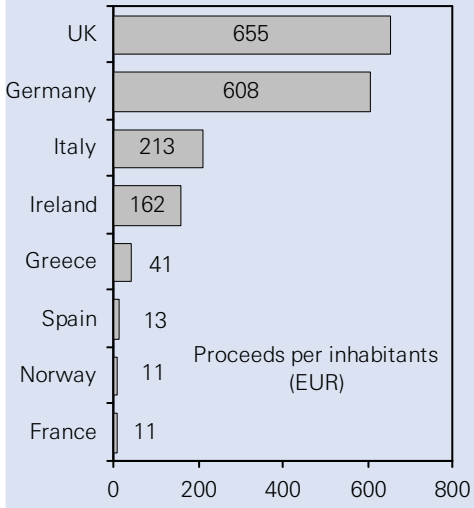
Source: DB Research, 2003

Mobile telephony market in Germany (expressed in %)



Source: EITO, 2003

3G licence costs



Sources: Reg TP 2000, DB Research

[5] With transmission speeds of more than 64 kbits/s, broadband technologies are more effective than the usual transmission routes via fixed-line network – from analogue connections right up to ISDN.

[6] For a discussion of the dotcom crash see Heng, Stefan et al. (2003): Dotcom crash: the worst is over in Germany, in: Deutsche Bank Research, E-conomics No. 39, Frankfurt a.M.

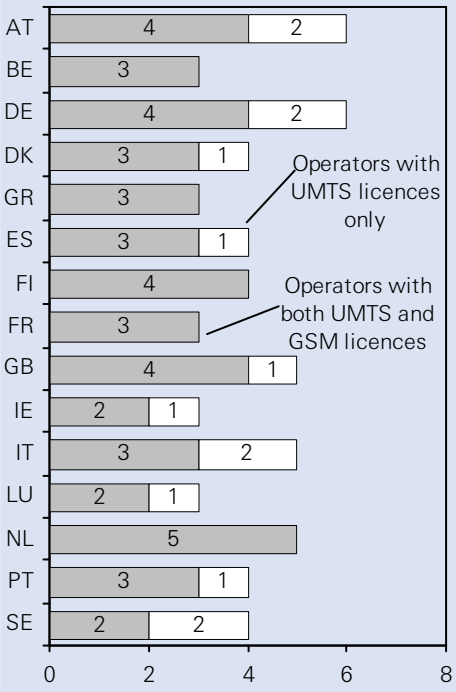
Complex demands of 3G

3G is far more dependent than 2G on close interoperability between terminals and network technology. Gaps in the wireless network, which will persist for years after 3G's launch, mean it is crucial that mobile phones function in both UMTS and GSM mode. This means they will have to be able to cope with different frequency bands, data protocols and fundamentally divergent network structures. For instance, with 2G the transition from one cell to the next is a clear hop, meaning the frequency changes. However, UMTS connections always stay on the same frequency. This demands seamless ("soft") handovers among the up to five base stations in constant contact with the user.

UMTS is based on the principle that all terminals communicate with the base station more or less equally "loudly" (i.e. at the same power level). This is achieved by power control. Even a single "too-loud" terminal can noticeably disrupt the entire system. Power control must react to the changing usage patterns of the radio cell very quickly, yet as seamlessly and incrementally as possible. The cell radius, for instance, shrinks during periods of high usage. To allow a soft handover, network planning must ensure a constant overlap among these "breathing" cells, which change size as usage varies.

The success of 3G depends on finding satisfactory and timely cell planning and soft handover solutions for multi-mode operations. The industry itself believes that satisfactory solutions for these complex issues can only be expected by 2005 at the earliest. Just as it did in the past, 3G will have to battle further delays in the future too.

UMTS licences, 2002



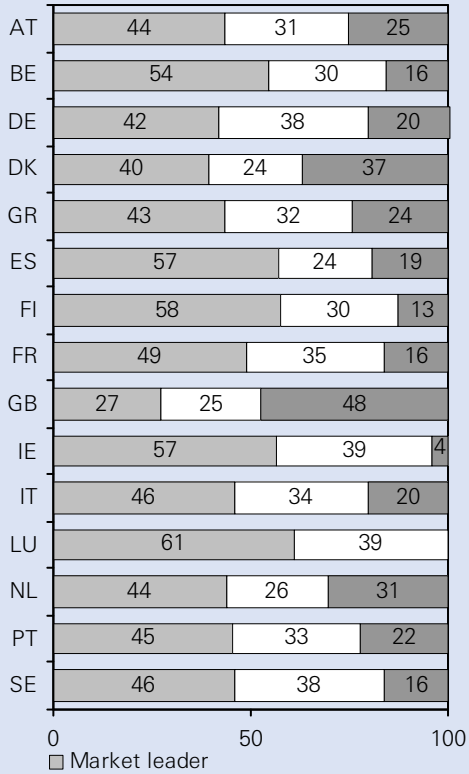
Source: European Commission, 2002

Labour pains at 3G rollout

The launch of Foma in Japan brought a multimedia, video-capable 3G system to the market as early as October 2001. Until then fierce competition with i-mode[7], already developed by the dominant telecommunications company NTT DoCoMo, had denied Foma any great commercial success. Currently, i-mode has 40 m users in Japan; Foma, by contrast, has only 500,000.

2003 saw 3G's launch in Australia, the UK, Austria, Italy and Sweden, with Denmark, Ireland, Hong Kong and Israel set to follow at the start of 2004. But 3G services are being greeted with low-key demand in Europe. At the moment they often reach only slightly over a fifth of the penetration rates that telecommunications companies had hoped to be achieving by now.

Share of GSM market
(%) *



* discrepancies due to rounding

Source: European Commission, 2002

3G urgently needs impetus

Unresolved challenges like technical design of wireless networks, delayed production of tailor-made terminals, the inadequate range of broadband services as well as cautious customers are all leading telecommunications companies to tread carefully. They have repeatedly postponed 3G's launch in some European countries, remembering the WAP flop at the turn of the millennium. 3G marketers should not fuel exaggerated expectations. Equally, immature technologies should not be allowed to discredit the entire project.

[7] For a discussion of i-mode see Heng, Stefan und Ursula Krueck (2000): M-commerce: mega business or Mickey Mouse?, in: Deutsche Bank Research, E-conomics No. 8, Frankfurt a. M., p. 8.

As late as mid-2003, the Portuguese national telecommunications regulator ANACOM received an application from licence holders to postpone from end-2003 to autumn 2004 the launch date set out in the licence conditions. In many European countries, commercial network operations will not start before mid-2004 owing to unresolved technical and economic difficulties. Nonetheless, the network coverage requirement of the German licencing agreement is likely to be fulfilled for the four companies still involved in UMTS business. 25% of the population should be reachable by the end of 2003. Owing to the density of population in certain regions, this corresponds to less than 10% of Germany's total land area. In terms of coverage, the agreement merely requires that the providers be technologically capable of supplying UMTS-based services on the mass market, not that they actually do so.

Japan, China and South Korea's mobile telephony agreement of September 2003 provided a spur toward supply of attractive hybrid services. Europe follows at some distance. The Open Mobile Alliance initiated by the German Regulatory Authority for Telecommunications and Posts (RegTP), the German Association for Information Technology, Telecommunications and New Media (BITKOM) and the European Telecommunications Standards Institute (ETSI) is opening up promising prospects for user-friendly interoperable solutions.

Mobile telephony's current financial and technological problems are leading critics to make overly pessimistic predictions that neither 3G (UMTS) nor its 3.5G extension (HSDPA) will ever become profitable. According to their logic, 3G should be bypassed and direct backing given to 4G, or WLAN as it is also known. On a fleeting analysis, the technological and economic challenges of WLAN do at first appear more easily solvable than the enormous difficulties of implementing 3G in practice.

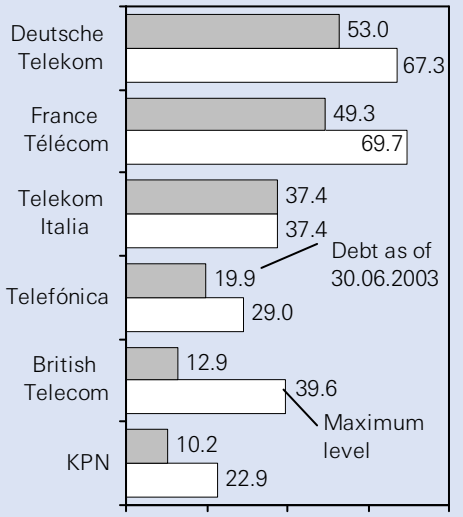
Mobility matters

UMTS is aimed principally at the nomadic user. In contrast, WLAN is aimed at the more or less stationary user in direct proximity to a base station (maximum radius: 300 m) and moving no faster than a walking pace. If the user moves to a different hotspot (access point), the connection is abruptly lost. A soft handover between WLAN hotspots is not yet achievable. However, this is no great restriction on the typical user sitting in a café, airport lobby or railway station. Today's WLAN hotspots can supplement, but not completely replace, the mobile networks laid down for wide-range coverage. WLAN has the advantage over UMTS in static situations when broadband access to data services is required. If the user needs greater mobility, the most suitable solution is Mobile Operator Wireless Local Area Network (MO-WLAN), a hybrid of mobile telephony technologies and WLAN. MO-WLAN, the actual 4G technology, presents complex challenges around the organisation of the various networks as well as the structure of mobile terminals. For this reason, its actual realisation is still a long way off. Apart from the differing usage situations, a comparison of UMTS and WLAN also throws up issues like security as well as investment and licencing costs.

WLAN versus UMTS – no hasty judgements

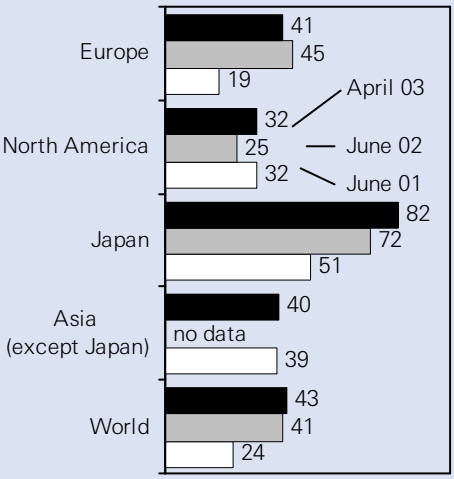
The currently accepted WLAN standard is IEEE 802.11b. This was established by the Institute of Electrical and Electronics Engineers (IEEE) and guarantees a maximum transmission rate of 11 Mbits/s. Building on this, a rate of 54 Mbits/s should become achievable in the near future. Apart from speed, investment costs are another point in WLAN's favour.

Debt position of selected telecoms companies
(EUR bn)



Source: Boston Consulting Group, 2003

Ownership of internet mobile phones*



* % of mobile phone

Source: A.T. Kearney & Judge, 2003

3G customers

	Total pop.	3G customers
	m	
Japan	127	0.5
Italy	58	0.3
UK	60	0.155
Australia	19	0.05
Sweden	9	0.009
Austria	8	0.006

Position: end-Q3, 2003
Source: Hutchinson, 2003

International agreements allow WLAN frequencies to be operated free of licences and charges. However, there are problems in operating IEEE 802.11b. Other radio-wave applications like Bluetooth or microwave appliances transmit along the same frequency and interfere with WLAN signals. Furthermore, uncoordinated WLAN base stations interfere with and blot each other out. However, the future standard IEEE 802.11a/ HiperLAN2 will bring the allocation of priority within frequency ranges. This should solve the problem of interference from other radio-wave applications. WLAN is then likely to become more attractive.

A WLAN access point is very cheap to install. The equipment needed costs less than EUR 2,000, making it affordable even for private individuals. However, the advantages of installing a hotspot should never mask the limitations of the backbone technology. Broadband is a prerequisite at the backbone (the interface between WLAN and the broadband telecommunications fixed-line network) if high transmission rates are to be achieved. But because permanent broadband connections via backbone technology (e.g. via DSL) generally carry considerable operating costs, public access on a non-commercial, private basis is often based on poorly performing backbone technology. This bottleneck substantially reduces the actual transmission rate of the entire system.

The degree of confidentiality and integrity associated with WLAN is not one of its strong points. Many companies are downright negligent when it comes to security. In a 2003 survey conducted by Ernst & Young, 52% of German companies questioned admitted that their networks were either not at all secure against unauthorised access, or only rudimentarily secured by Wired Equivalent Protocol. Another problem is that WLAN networks often reveal the names of the hardware manufacturer, the network or the user company, making it easier to gain illegal access. The Internet Protocol Security Initiative is looking for ways to guarantee better security and confidentiality. Nevertheless, these have yet to be implemented in practice.

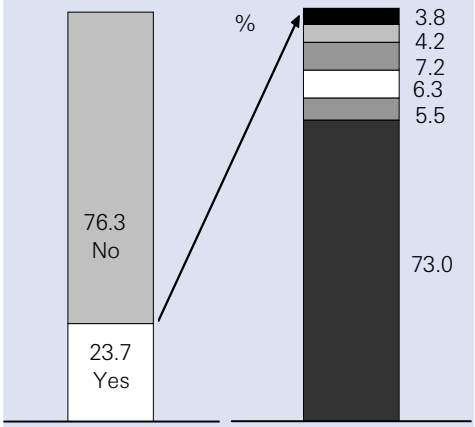
UMTS and WLAN are both advantageous in certain situations, although neither technology is entirely superior to the other. A profit-oriented product must therefore aim to combine the advantages of the technologies through cooperative ventures to create lasting value-added for the user. Research is necessary to see which market segment would initially find the innovation most useful.

Gold diggers or shovel sellers – who profits?

We expect global sales of WLAN products to reach EUR 400 m in 2003. The market for WLAN security technology is especially dynamic: worldwide sales are set to rise to EUR 250 m by 2010 (2003: EUR 50 m). Sales are driven not only by hardware but also by services. For instance, ARPU in the USA will rise from EUR 1 to EUR 11 within three years. Revenues from user charges, which currently amount to around EUR 20 m in Europe, are increasing significantly. The numbers accessing the internet via WLAN will grow from 1.3 m to 3.5 m over the next three years in Germany alone. By then the number of publicly accessible (non-commercial) WLAN hotspots in Europe will have risen to 37,000 (2000: 150). Swisscom Eurospot, AOL Deutschland, GlobalAirNet, T-Mobile and Vodafone D2, among others, together planned to establish more than 2,800 WLAN hotspots in Germany alone by end-2003 (March 2003: 1,600 hotspots).

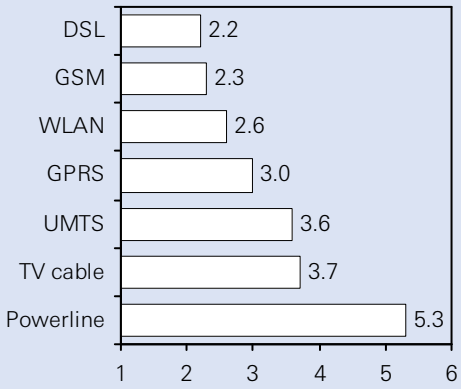
Looking away from the future commercial potential of WLAN equipment, WLAN services (in the form of the actual hotspots) are very seldom backed by a profit-oriented business model as yet. Just as during a gold rush,

Commercial potential of WLAN, Germany



Source: Soreon Research, 2003

Estimated significance of telecommunication technologies, 2005*



1=very important; 6=completely insignificant

*Survey of 130 specialists and executives

Source: Mummert Consulting, 2003

when it comes to WLAN, hardware sellers will make the greatest short-term gains. Nevertheless, WLAN will also become a key business area for data service providers in the medium term. Accordingly, it is already taking on a prominent role in the overall strategy of telecommunications companies. WLAN should ultimately lead customers to the new services, thus helping to launch UMTS. Many telecommunications network providers have recognised this need for a hybrid solution. They are working to embed WLAN into the technological environment of mobile telephony itself. To this end they are operating WLAN hotspots alongside the UMTS network. It is worth noting here that customers' willingness to pay for content provided by modern information and communication services is still very low. Digital services with costs attached are accepted neither on the internet nor in the mobile telephony sector. In this case, there is quite a job in store at telecommunications companies for marketers, and particularly for the research and development departments.

Convenient service as key to the business

Two out of three WLAN users currently access the internet for free. The few profit-oriented WLAN hotspots (e.g. Berlin-Tegel airport, Deutsche Bahn railway lounges, and the Hilton, Kempinski and Lindner hotel chains) are partial solutions mainly based upon vouchers specific to the provider.

New billing models should open the door to the mass market. In the case of cross-network billing systems, it makes sense for the telecommunications provider that already has a relationship with the customer to issue the common bill. A clearing facility with an extensive, even cross-border billing model would make WLAN use much more attractive. The Association of the German Internet Economy (eco) is providing significant impetus here through its Greenspot system. By early 2004 it ought to be possible in Germany to conveniently include WLAN services from various hotspots in the monthly mobile phone bill. There are plans to bill for access based on connection time and not, as with UMTS, on data volume.

As turnover in voice services stagnates, the fate of UMTS and WLAN as advanced wireless technologies hinges on offering the customer a tailor-made portfolio of broadband data services with cross-network billing. This must be based on interoperable standards with a high level of security.

Looking ahead

The typical user is primarily interested in the value- added provided by the service package on offer; the underlying wireless technology is merely a secondary concern. It is notable that even four years after 3G licences were awarded in Central Europe, there is still no sign of one truly broadband-dependent application capable of winning large numbers of customers over to the new technology. Accordingly, the market for m-business applications remains in its infancy, and not only in Germany. Some telecommunications companies, though, now believe they have found the killer application for broadband supply of hybrid solutions in the commercial marketing of music and video files, chat applications, or erotic and sport content.[8] Even for traditional content suppliers alone, digitised services (in publishing, radio broadcasting and the music industry) are likely to generate turnover of over EUR 3 bn in three years' time (2003: EUR 350 m).

[8] For a discussion of the business fields for broadband mobile systems see Heng, Stefan (2001): 3G – chance for take-off in mobile business, in: Deutsche Bank Research, E-conomics, Nr. 20, Frankfurt a. M., p. 8f.

WLAN and UMTS

	UMTS	WLAN
Coverage (in metres)	5,000	300
Bandwidth (in Mbit/s)	2	54

Source: Accenture, 2002

Technology generations in digital mobile telephony

2G	**up to 10 kbits/s**
CDMAone	Code Division Multiple Access
GSM	Global System for Mobile Communication
PDC	Pacific Digital Cellular System
TDMA	Time Division Multiple Access; synonym: USDC
USDC	US Digital Cellular System; synonym: TDMA
2.5G	**up to 384 kbits/s, based on 2G**
EDGE	Enhanced Datarates for GSM Evolution
GPRS	General Packet Radio Service
HSCSD	High Speed Circuit Switched Data
3G	**up to 2 Mbits/s**
CDMA2000	Code Division Multiple Access 2000
TD-SCDMA	Time Division Synchronous Code Division Multiple Access
UMTS	Universal Mobile Tele-communication System; synonym: W-CDMA
W-CDMA	Wideband-Code Division Multiple Access; synonym: UMTS
3.5G	**up to 20 Mbits/s, based on 3G**
HSDPA	High Speed Down-Link Packet Access
4G	**up to 100 Mbits/s**
MO-WLAN	Mobile Operator Wireless Local Area Network

Apart from digitised content, telecommunications companies are relying more on services like electronic payment systems and personalised location-based services, but especially on the multimedia messaging service (MMS), the more advanced version of text messaging (SMS). According to the German Association of Telecommunications and Value-Added Service Providers (VATM), in 2003 network operators will earn 17% of their turnover from data services (2002: 15%) and 16% from SMS services alone (2002: 14%). The GSM Association reports that the worldwide number of text messages sent each month rose from 4 bn to 24 bn between January 2000 and May 2002. The acceptance of SMS is due in no small way to the ability of this very simple service to function across systems. When it comes to placing new value-added services, telecommunications companies can latch on to this aspect of "any-to-any" communication. The package will increase in attractiveness as service portals move away from the concept of restrictive, protected "walled gardens" and instead embrace a broad spectrum of services.

Success through cooperation

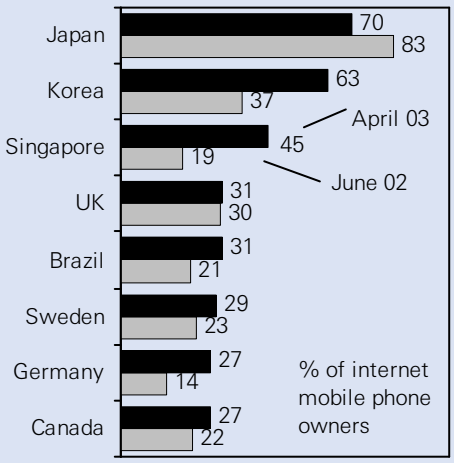
No single communications technology on the market is superior to the others in every respect. 3G's main drawbacks are the lack of availability of multi-mode terminals with tailor-made functionality, and the repeated delays in and expense of network construction. On top of this come transmission rates: these are significantly faster than 2G, but still slow compared to WLAN. The challenges for WLAN lie in the organisation of hotspots, usage of the frequency spectrum, the poor level of security and the billing model.

As yet, no one has put together a WLAN service package with a customer-friendly, transparent pricing system. WLAN and UMTS will only be commercially successful in cooperation with each other and with the services already offered by GSM and GPRS. An attractive package will only result from combining the advantages of wireless technologies in terms of transmission rates, area coverage, convenience of use, security and operating costs. Only a continuum of technologies and services offering tailored solutions to both stationary and nomadic users has market potential. No *single* killer application will bring about the big commercial breakthrough. A cross-technology service portfolio offering real value-added to the masses has the only chance of success. Ultimately, the customer is only interested in the value-added of the application, not in the underlying technology.

The worst is over in the telecommunications sector. Despite all prophecies of doom, the industry, with its sales increases of 3.6% in 2003 and over 4% in 2004, is still one of the pillars of German economic growth. The dynamism throughout the sector stems largely from the development of innovative wireless technologies. It is clear that only companies that abandon protectionist approaches and strive for interoperable solutions have a chance of establishing a profitable business model. However, advanced wireless technologies will not become profitable before the start of the next decade. For that reason euphoria is misplaced; staying power is called for instead. Despite renewed extremely favourable forecasts from some institutes close to the sector, real commercial success for advanced wireless technologies is by no means a foregone conclusion. Network operators, mobile terminal manufacturers and service providers all face this challenge together.

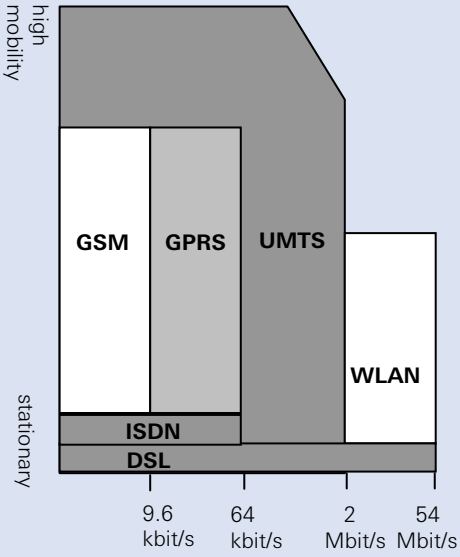
Author: Stefan Heng, +49 69 910-31774 (stefan.heng@db.com)

Mobile internet usage



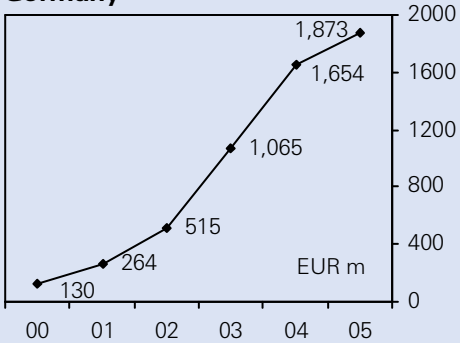
Source: A.T. Kearney & Judge, 2003

From GSM to WLAN



Sources: Detecon, DB Research, 2003

M-business market turnover, Germany



Source: Berlecon, 2003

Current Issues

ISSN 1612-314X

Available faster by e-mail!!!

The Current Issues series treats economic and societal topics of fundamental importance. Currently, the main focus is on issues such as Germany's return to growth, questions and problems relating to demographic developments world-wide, as well as China's growing economic and political status.

Recent topics	published on
China's financial sector: Institutional framework and main challenges	January 9, 2004
German growth potential: facing the demographic challenge	December 11, 2003
Ageing, the German rate of return and global capital markets	December 4, 2003
EU trade in CO_2 emissions: 2005 launch deadline at risk	December 2, 2003
Japan - pain postponed	November 11, 2003
Upswing 2004 - a delicate balance	October 29, 2003
Ageing calls for further internationalisation in banking	October 28, 2003
The silver test - Ageing customers challenge companies at every level	October 10 2003
Innovation in Germany: Mind the gap!	October 10, 2003
Liberalisation of the German gas industry - under pressure to increase competition	October 8, 2003
Demography sends tremor through German property market	September 26, 2003
Reformstau - causes and remedies	September 18, 2003

All our publications can be accessed, free of charge, on our website **www.dbresearch.com**.
You can also register there to receive our publications regularly by e-mail.

Ordering address for the print version:

Deutsche Bank Research
Marketing
60272 Frankfurt am Main
Fax: +49 69 910-31877
E-mail: marketing.dbr@db.com

Economics
ISSN 1619-3245

All our publications can be accessed, free of charge, on our website **www.dbresearch.com**.
You can also register there to receive our publications regularly by e-mail.

For the print version please get in touch with:

Deutsche Bank Research
Marketing
60272 Frankfurt am Main
Fax: +49 69 910-31877
E-mail: marketing.dbr@db.com

Printed by: HST Offsetdruck Schadt & Tetzlaff GbR, Dieburg.
Print: ISSN 1619-3245 / Internet: ISSN 1619-3253 / E-mail: ISSN 1619-4756