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Always-On Demand—The Digital Future of Communication[1]

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1 Introduction

The development of third generation (3G) mobile technologies remains a sensitive issue in Europe. The conflict between slower growth in the mobile communications markets and the high levels of investment needed to build UMTS networks has left the telecommunications industry facing enormous challenges. At the present time, it is not clear whether and when investments for UMTS licenses and for building the network will be recovered.

The origins of the public debate surrounding UMTS show that it is impossible to make accurate predictions regarding the digital future of communication. Short-term developments are usually overestimated while long-term effects tend to be underestimated. However, the developments we can observe in present-day technology and society provide some insight into the future of communication and highlight implications for future business and society models.

From the point of view of technology, basic trends include miniaturization, digitalization, networking, and the further development of mobile communications structures. Closely related to these trends are social developments and changes in users' interests: globalization, mobility and flexibility, teamwork, and knowledge transfer as well as changes in the relationship between the public and private spheres.

New, more diverse, and rapid means of communication are appearing. In a globalized world where great emphasis is placed on the mobility and flexibility of the individual, "always on strategies" ensure availability any time, any place. "On demand strategies" support this flexibility in terms of space and time.

Always-on demand? There is still some way to go before mobile platforms become widely accessible and the man/machine interface becomes easier to manage. Besides the issue of whether a technology proves to be useful in prac-

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tice, more important still is the social and cultural context of any new technology. Therefore the key to realizing future visions lies in the ability to combine technical capability with what is socially desirable.

2 Mobile Technologies: Forecasts Ranging from Euphoric to Gloomy

"The future of UMTS—From euphoria to disillusionment to financial burden" (Friedrich-Ebert-Stiftung, 2002); the title of this publication neatly sums up the way the public debate on 3G mobile technologies has developed. In August 2000, when German UMTS licenses were sold for almost € 50 billion, the marketplace was in a state of euphoria, eagerly anticipating a new era of communications and future profits.

Shortly thereafter the financial markets' confidence in the telecommunications sector began to wane. After a decade in which mobile telephony had determined the development of telecommunications markets, 2001 proved to be a turning point, raising many issues regarding the future of 3G (Knape, 2003). None of the major mobile communications groups (IDATE, 2002, p. 50) achieved their targets in 2001 and T-Mobile, KPN Mobile and BT Wireless had to postpone planned stock flotations (cf. Booz Allen Hamilton & GCI Hering Schuppener, 2001, p. 6). Insiders were skeptical about the future of mobile communications and were even asking themselves whether UMTS was "superfluous" (Friedrich, 2001).

Reasons given for the disillusionment include a lack of customer focus, the fact that new technologies and end products are not yet ready for market, the increasing complexity of integrated software and resulting susceptibility to error as well as the fact that a fundamental rule of business has been ignored: "Instead of identifying need, finding a solution, building up the business and then regulating it, with 3G attempts have been made first to regulate it, then to create a business and find a solution, while all the time trying to identify customer need." (Hürlimann, 2001).

Therefore, mobile Internet access (e.g., via Wireless Application Protocol WAP) is still limited in Germany, despite the extremely positive forecasts that accompanied its introduction. Studies such as that of the European Institute for the Media (EIM) on the World Internet Project (WIP) in Germany show that less than a fifth of all cell phone owners with Internet capability actually use mobile Internet services (Groebel & Gehrke, 2003).

Conversely, in Japan the mobile communications operator NTT DoCoMo and its i-mode service has established an extensive consumer base for

its mobile Internet service. Forty million Japanese citizens (two thirds of the country's mobile communications customers) use i-mode. This is clearly reflected in NTT DoCoMo's revenues per customer. While subscribers to mobile communications services in Europe spend on average around € 400 per year (with a declining trend), in Japan i-mode users pay more than € 80 per month (IDATE, 2002, pp. 51–52, 62).

The Japanese example illustrates how the wireless digital future could look. With third generation mobile technologies, the consumer is offered a wide-ranging choice of multi-media communications services; voice telephony is just one among many. This new market model fundamentally alters the corporate value chain. Costs are no longer calculated on the basis of talk time but on the quantity and quality of data requested (cf. Friedrich-Ebert-Stiftung, 2002). Thus, the tasks facing the network provider are fundamentally different from when GSM was introduced. Alongside the infrastructure, it is important to build up a service and content portfolio, either working alone or in collaboration with other providers, as well as developing new business models and marketing strategies.

Assuming a virtually saturated mobile communications market, it is anticipated that business customers will prove most profitable initially, followed later by other groups in society. IDATE predicts a further increase in the number of cell phone users in Western Europe, the establishment of 3G, and an increase in per-head expenditure on mobile telecommunications services at the expense of pure voice telephony.

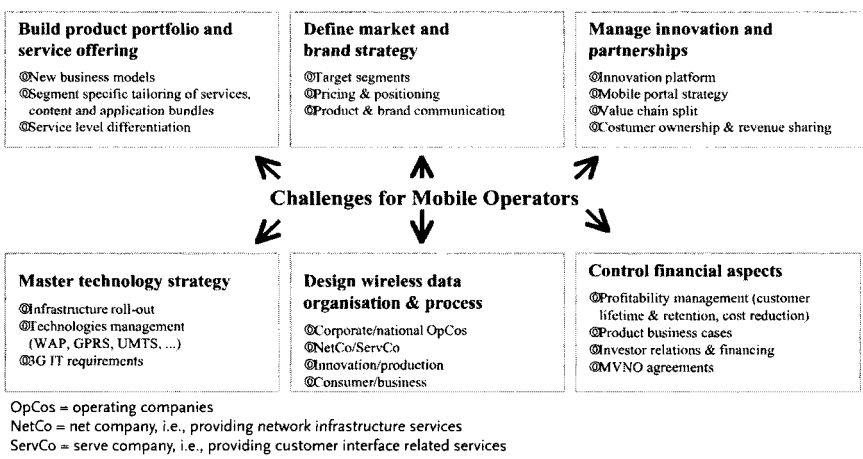

Figure 1: Wireless Data Challenges for Mobile Operators Europe
(Source: Booz Allen Hamilton & GCI Hering Schuppener 2001, p. 9)

Table 1: GPRS and UMTS market prospects in Western Europe

Evolution of the number of mobile data service users over GPRS/UMTS networks (millions)	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Total number of cellular subscribers	243.0	275.8	299.2	316.4	328.6	337.2
Number of GPRS/UMTS users	0.0	0.1	3.7	18.5	44.9	81.7
Penetration	0.0%	0.1%	1.2%	5.9%	13.7%	24.2%
Evolution of the ARPU						
Voice ARPU (€)	39.8	35.0	33.0	31.8	31.1	30.9
Data ARPU (€)	2.5	2.5	4.0	4.9	6.4	9.0
Total ARPU (€)	42.3	38.4	37.1	36.7	37.5	39.9

ARPU: average revenues per user *(Source: IDATE, 2002, p. 66)*

But how realistic is customer interest in Europe? GSM fulfills the fundamental requirements of availability irrespective of location, simplicity and security. Deciding what will become the "killer application" of the up-and-coming mobile communications generation is a contentious issue. Mobile communications market analyst Mathias Plica, for example, sees "mobile bandwidth" as a true killer application (Pauler, 2002). Visualization by means of new services (MMS or innovative UMTS-services) may also prove a winner. The success of future mobile communications will be determined ultimately by the ways in which technical capability is used to address social needs.

Aside from the problems specific to each case, the underlying thinking is all too familiar. Ken Olson, founder and chairman of DEC, said in 1977: "There is no reason anyone would want a computer in their home." When making predictions about innovations, short-term developments are usually overestimated, and long-term effects tend to be underestimated. Technological developments and applications do not appear from nowhere; instead they are integrated as socio-technical systems into an evolving social and technological development process. Therefore, an analysis of key basic trends in technology and society provides an insight into general trends for the future.

3 Technological Development Processes: Basic Trends

The basic technological trends include miniaturization, digitalization, networking, and the further development of mobile communications structures.

3.1 Miniaturization

By miniaturizing electronic components one can increase the capacity and performance of IT and communications systems. Advances in microelectronics paved the way and provided the driving force for the dramatic overall growth in information and communications technology. One example is the Motorola International 3200. Known as "the bone" and weighing 520 g, it was one of the first GSM telephones back in 1992. A more recent Motorola device, the C 330 "hourglass", or Nokia's 8210 model weigh just 78 g and are much smaller, with far more functionality.

The technical integration of functions and portability of communications devices are a result of this process. Miniaturization and mobility go, quite literally, hand in hand. Cell phones featuring organizers, integrated digital cameras and navigation systems have been launched in the marketplace. Siemens has developed, for example, a "wrist phone" which is a miniaturized triple-band GSM cell phone. A device the size of a wristwatch contains voice-call functions, a hands-free device, triple-band GSM technology as well as an actual watch.

Through high data transfer rates and the further development of menus and displays, a smooth transfer from IP-based Internet services also becomes possible via UMTS-compatible cell phones (Gaida, 2001). The technological trend of miniaturization is experiencing a new spurt and is moving towards even smaller nanostructures with exciting new product innovations, not only in the area of microelectronics but also, for example, in the areas of biotechnology, medical technology, and materials technology.

3.2 Digitalization

It was the digitalization of all components in the communication process which first made it possible to dramatically increase capacity and converge networks, end products, services, and contents. The common denominator is zero or one.

Digitalization supports trends toward dematerialization and universalization: first, digital files can be copied and distributed as dematerialized products almost ad infinitum; and second, this makes digital files universally usable. The copy process replaces material production and physical transport is rendered unnecessary by digital data flows. The possibilities offered by currently available methods and technologies have not yet been explored (Fischer, 2002).

Moreover, dematerialization involves replacing products with services: for example, buying the rights to use a software program rather than acquiring and owning the product. Research using an online dictionary can theoretically replace the need for (and ownership of) a book. Physical presence is additionally supplemented via telecommunications services using virtual presence as an alternative. This further promotes the mobility and flexibility of the individual.

3.3 Networking

The third basic technological trend is networking. Use of networking for companies, individuals or groups increases through expansion once a critical mass of consumers is reached. Use of the telephone came into its own once it had reached a critical mass. Nowadays the Internet is the central catalyst for this type of network effect.

From a technical standpoint, networked cluster formation increases capability. In other words, the combination represents more than the sum of the individual capacities. Examples from the IT area are PC clusters or processor clusters. The same concept applies to the economy. Innovative company clusters can, for example, increase the economic performance of regions, with corresponding spin-off effects for the job market and for training opportunities, quality of life, etc. "A cluster influences the market in three ways. First, it creates greater efficiency (...). Second, it drives opportunities for innovation (...). Third, a cluster has a positive influence on the start-up rate of new firms", according to Harvard professor Michael E. Porter (Heuer, 2002, p. 21; Ketels, 2004; Steinbock, 2004). In Germany, an example for this type of company cluster is the IT cluster in Dortmund, North Rhine-Westphalia. The formation of networks and clusters will play a major role in the future of mobile telecommunications, the shaping of business models and the innovation potential of the sector (Steinbock, 2004).

3.4 Further Development of Mobile Communications Structures

Mobile communications increases spatial independence and offers greater room for maneuver. Higher transfer capacities of third generation (UMTS) or Wireless Local Area Networks (WLAN) allow a data-intensive and mobile visual communication (graphics, images, videos, music), which would have been unthinkable just a few years ago. Depending on the location and speed of the receiver as well as the number of users, transfer rates with UMTS reach between 144 kbit/s and 2 Mbit/s (Gaida, 2001, p. 62; Lehner, 2003).

Besides this increase in the performance and capacity of mobile communications structures, another major technological change in mobile communications is provided in the shape of "always on technology". 3G allows for flexibility and mobility in radically new ways, through personalized content at any time, in any place. A permanent online connection, the use of which is then charged not in terms of time, but according to the data packages transmitted, opens up fundamental new communication options (e.g., instant messaging, online games or up-to-the-minute transfer of information and news services).

4 The Social Context: Basic Trends

These fundamental technological trends are closely related to social developments, changes in users' interests and changes in the social 'climate'. This is all the more important given that specific individual technologies will—it is assumed—increasingly fade into the background. "Link-up technology will no longer be at the forefront as was the case for decades with analogue fixed network link-up technology (...). The infrastructure of the future will be more of a mix of different technologies, tailored to specific requirements." (OFCOM et al., 2001)

4.1 Globalization, Mobility and Flexibility

Globalization, mobility and flexibility are requirements of our modern society. "Always-on" strategies allow us to be contacted at any time and in any place. Permanent mobile communications is an essential part of life to many people and many suffer as a result: communication replaces physis.

Furthermore, new, flexible means of rapidly "switching" between private and business communication are available, dependent on context rather than location: Situation replaces localization.

This spatial flexibility is supported through "on demand strategies". Direct personal communication "outside the workplace" ensures a permanent connection to commercial or domestic information highways. Databases and information are available at all times and can be accessed whenever and wherever they are needed, irrespective of whether the person is in a particular location, either in the workplace or at home.

Whether such developments are actually a blessing or a curse is open to discussion. Anything can be found, but it is possible to get lost in the sheer volume of information available. The authors of the Japanese study for the aforementioned World Internet Project report, for example, found that Japanese citizens who use the Internet while on the move show a significant and marked lack of purpose regarding their objectives in life compared with those who access the Internet via PC or not at all. "Could this be a reflection of the group's absorption in communication with friends unsuccessfully finding their objectives in life?" (Institute of Socio-Information and Communication Studies & Communications Research Laboratory, 2001, pp. 132–133).

Do we have sufficient capacity to select and process information ourselves? Who is able to determine for themselves when to stop? Greater availability increases the pressure to perform and each individual has to make more and more decisions regarding what is really important.

At the same time, these new services allow a positive interpretation of globalization, flexibility and mobility. It is possible to call or transmit data to someone living in a wooden hut in the middle of nowhere. This promotes, as explained in the next point, teamwork and knowledge transfer.

4.2 Team Work and Knowledge Transfer

Comprehensive teamwork requires for the most part face-to-face meetings at selected locations, frequently involving travel. Electronic knowledge transfer provides an alternative through global network structures. Higher broadband capacities in the electronic transfer of information allow better visual communication and the integration of additional and contextual information (in-sight view) relevant to the decision-making process. In expanding and enhancing virtual communication content, we help satisfy one of the key requirements for fully functional knowledge transfer: the transformation of implicit personal knowledge into explicit common knowledge.

In private communications too, Multimedia Messaging (MMS) services allow freedom of expression and communication. Through MMS, images and sound can be sent independently of time and location. Mobile commu-

nications providers hope that, as a direct result of this type of visualization, the application will be widely accepted, thus generating greater opportunities for profit.

4.3 The Public-Private Relationship

Changes in communication infrastructures also allow conclusions regarding public/private interaction. Take, for example, the image of the telephone kiosk; telephone kiosks have been transformed from being fully enclosed into free-standing columns. "The world is a living room" (Rauterberg, 2002) ran the headline in the German weekly Die Zeit, "Cell phone boom. Telephone kiosks a thing of the past", according to Süddeutsche Zeitung (Bock, 2001). The same analogy, only more radical, can be applied to the use of cell phones in public places, whether this be a restaurant, train compartment or waiting room.

Irrespective of actual location, we switch happily between the private and public spheres. Communication can take place in any location and may be completely detached from the setting for the conversation (intimacy, grief, commercial secrecy). The public is given, often without any consideration, an "in-sight view" into private or commercial matters; this may be called push-privacy.

This has also proven to be the case on the Internet where it has become increasingly more acceptable to talk about private matters in the public arena. Intimate relationships, confidential matters and emotional private events are no longer kept discreet and instead are voluntarily brought out into the open via webcams, in chat rooms or online diaries; in this case a form of pull-privacy.

The increasing propensity to discuss private matters in public is an international phenomenon, encouraged partly by the population's desire to leave behind traditions and values passed down through the generations and to experiment with different media, but also through the efforts of media groups to produce content which is cheap and "up to the minute" (Koenen & Michalski, 2002).

The risks inherent in private exposure (e.g., infringement of privacy and human dignity as well as unintentional consequences of self-revelation), as well as new cultural impulses can be created which call into question long-standing norms and values through the public medium (e.g., social discourse on taboo issues such as illness, unconventional lifestyles etc.). Removing taboos in this way can give the impression that the virtual public arena is somehow less "threatening" than the immediate private environment. Unlike

with mobile communications in public places, the net-using public is only confronted with such "private matters" if people actively search for them and access them "on demand" (Konert & Hermanns, 2002).

5 Visions for the Future and Outlook for "Always-On" and "On Demand"?

We are still some way from a world in which access to mobile platforms and applications is as simple as accessing electricity. The service is complicated and not exactly user-friendly. Accessing the Internet quickly via WAP or exchanging address and telephone details between two cell phones is something only die-hard users have the patience for.

There are many possible scenarios: Similarly to switching on an electrical appliance and getting electricity straight away, it should be possible to gain immediate access to the Internet without complicated menu procedures which vary from one service provider to another. Also, sharing digital data between technical end products such as digital organizers or cell phones could be simplified.

IBM, for example, has developed an idea which has now been adopted by the Japanese telecoms provider NTT and its mobile communications subsidiary DoCoMo. In the future, it will be possible to exchange telephone numbers or digital business cards electronically through a handshake (Ziegler, 2002, p. 50). Receivers are either PDAs or cell phones which automatically establish a small computer network through skin contact and transfer the required data using the electrical conductivity of the human body. The hardware need not be placed directly on the skin. It should be noted that the electrostatic fields generated are much lower than the charges you receive, say, when combing your hair—around 1000 times weaker. This form of interface between humans and machines could conceivably be developed as a biotechnical key for Internet access or other access rights, e.g. the door to one's house. Thinking even further ahead, by implanting technology chips in the human body, it might even be possible to remove completely the external technical interface in the shape of the cell phone or PDA.

When assessing the feasibility of these visions for the future, it is important to take into account not only technical capability but also the socio-cultural context. For instance, the body's own data transfer system described here might not be well received in parts of Asia given their cultural attitudes to human contact (handshake). The inertia effect of cultural context, ethical

convictions and behavioral traditions are often underestimated by innovation-happy engineers.

The key to realizing future visions lies in combining technical capability and social desires. That is easy to say, but requires considerable effort on the part of all involved to lift their gaze beyond their own specialist world and carry out a realistic assessment of future developments and user interests.

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