TAGUNGSBERICHTE

Of Visions, Dreams and Nightmares: The Debate on Converging Technologies

Report on the Conference „Converging Technologies for a Diverse Europe“, Brussels September 14 – 15, 2004

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1 The context

The occasion for the conference “Converging Technologies” was the launching of a public discussion on the report of a High-Level Expert Group (HLEG) “Foresighting the New Technology Wave”. The report, entitled “Converging Technologies – Shaping the Future of European Societies”, was edited by the philosopher Alfred Nordmann. Additionally, there were reports from several special interest groups (or working groups of the panel as a whole), position papers from individual members of the HLEG, a collection of state of the art reviews and related papers, and finally a set of comments by invited experts submitted prior to the conference.*

The exercise was organised by the foresight unit (K2) within the European Commission’s Directorate General Research. The HLEG was set up towards the end of 2003 and met formally four times between February and mid-June 2004, with communication within the special interest groups (SIGs) organised by their respective chairpersons. It was composed of a total of 25 experts coming from a broad range of scientific disciplines and chaired by the historian Kristine Bruland of the University of Oslo.

The HLEG was set up largely in reaction to activities on the convergence of nanotechnology, biotechnology, information technology and cognitive science (abbreviated and hence forward referred to as NBIC) by the National Science Foundation in the US, most notably the publication of a conference report “Converging Technologies for the Improvement of Human Performance” (Roco, Bainbridge 2002; see section 2 below) and subsequent annual conferences on the topic.

2 The background

Converging Technologies (CT) emerged as an issue of scientific and political discussion in the US. It takes up the notion of ‘convergence in the digital world’ which was developed in the IT, multimedia and entertainment industries in the nineties, and applies it to a current technological trend: Nanotechnology enables many new approaches, processes and materials at the nanoscale as well as analytical access to and theoretical understanding of fundamental chemical, physical and biological processes at atomic and molecular level. The implications of these trends, and their synergies with information technology are described in a RAND report published in 2001 (RAND 2001). On December 3-4, 2001, the National Science Foundation (NSF) and the US Department of Commerce (DoC) at the request of the National Science and Technology Council (NSTC), Subcommittee on Nanoscale Science, Engineering and Technology (NSET), organized a workshop on “Convergent Technologies to Improve Human Performance”. The outcomes of this workshop and contributions submitted after that meeting were published in June 2002 in a report of the same title (Roco, Bainbridge 2002).

According to the report, “the phrase ‘convergent technologies’ refers to the synergistic combination of four major “NBIC” (Nano-Bio-Info-Cogno) provinces of science and technology, each of which is currently progressing at a rapid rate: (a) nanoscience and nanotechnology; (b) biotechnology and biomedicine, including genetic engineering; (c) information technology, including advanced computing and communications; (d) cognitive science, including cognitive neuroscience. Accelerated scientific and social progress can be achieved by combining research methods and results across these provinces in duos, trios, and the full quartet. (…) This progress is expected to change the main societal paths, towards a more functional and coarser mesh instead of the less organized and finer one we have now.”

Topic as well as content of this report almost immediately attracted great attention from the technology assessment and foresight communities as well as national R&D policies. After the publication of the US report they became the subject of international discussions.

Other reports (TAB 2003; Paschen et al. 2004) characterized the US approach as being very futuristic and open to the ideas of "visionary engineers" (such as Ray Kurzweil) and the "transhumanist" movement. It has been criticized for mixing science and science fiction (Royal Society, Royal Academy of Engineering 2004) as well as for displaying a disquieting "insouciance" towards problematic aspects of the pursuit of human enhancement that could eventually lead to a "humanly diminished" Brave New World (President's Council on Bioethics 2003). It was also a task of the European HLEG to deal with the questions raised in the US report. Some of the, from our perspective, most problematic aspects of the US NBIC initiative will be outlined below.

3 Problematic Features of the US Initiative on Converging Technologies

The US public-private NBIC initiative could be seen as a by-product of the US nanotechnology initiative (NNI) and certain characteristics of NNI prepared the ground for the CT visions. The US nanotechnology strategy focussed from its beginnings - in the middle of the last decade - on new forms of transdisciplinarity and the unity of concepts among disciplines. Along with this soon came a highly optimistic rhetoric concerning the prospects of technological change. In an NSF workshop report on nanotechnology research directions published in 1999, an important proponent of the NBIC initiative wrote: "The convergence of nanotechnology with the other three power tools of the twenty-first century – computers, networks, and biotechnology – will provide powerful new choices never experienced in any society at any time in the history of humankind" (Canton 1999). In the NSF/DOC report (Roco, Bainbridge 2002) this bold vision is further elaborated: CT can potentially bring about

- a "new renaissance" within the 21st century, based "on a comprehensive understanding of the structure and behavior of matter from the nanoscale up to the (…) human brain",
- "world peace, universal prosperity and an evolution to a higher level of compassion and accomplishment",
- enhanced performance in all areas of human life,
- "wholly new kinds of rigorous research on the nature of both culture and personality" and a unification of knowledge by combining natural sciences, social sciences, and humanities,
- a global !networked society of billions of human beings", comparable to "one single interconnected 'brain'" or to "a larger form of a biological organism", and
- a "predictive science of societal behaviour", allowing "advanced corrective actions", based on NBIC and with the goal "to interdict undesirable behaviors before they cause significant harm to others and to support and encourage behaviors leading to greater social goods".

While some critics ridiculed this vision, criticized it for its conceptional vagueness and disregard for mainstream science (Royal Society, Royal Academy of Engineering 2004) or dismissed it as a slippery slope to a Brave New World (President's Council on Bioethics 2003), others appraised it as a pioneering work with necessarily provocative features that should not be taken too seriously.

The proponents of the initiative, however, seem indeed to take their visions seriously: In a publication on the results of the second NBIC workshop in February 2003 (Roco, Montemagno 2004), there is some new wording within the rhetorical framework (e.g. "social responsibility", "democratic rights", "deliberate choices", "democratization", "satisfying the needs of different lifestyles, cultures, and 'value sets'") – and even the idea of starting a NNI research project "to think about the language that can best be used to advance our common cause" (Bond 2004). Problematic features of the initiative's approach are nevertheless retained and even radicalized: In one contribution (Canton 2004) possible misuses of CT by autocratic regimes and the "specter of eugenics" are mentioned, but it is also deterministically stated that human enhancement and designed evolution will inevitably be future tools for shaping societies. In another paper (Bainbridge 2004), a rather bizarre and polemical piece, the author predicts that a biology-inspired approach to social sciences "will allow us to engineer culture" and,

among other things, recommends "memetics" (cf. Strong, Bainbridge 2002), internet research, Friedrich Nietzsche's "The Birth of Tragedy" and Oswald Spengler's "The Decline of the West" as useful starting points for the elaboration of such an approach.

There's nothing to be said against new tools of quantitative research, and organic metaphors, as well as biological concepts, are quite well established in social sciences and cultural theory. Even "memetics" may deserve attention. But the initiative's long-term goal to merge different disciplines into a single "hard" human science is questionable and seems to be rather unrealistic. In any case, polemics won't help to reduce the notorious gap between the "two cultures" of scientists and humanists. It is therefore an encouraging sign that some parts of the US NBIC community seem to be – increasingly – interested in a thorough and comprehensive analysis of the subject. Noteworthy works are included in the publications of the initiative (e.g. Gorman 2004, Khushf 2004a, or earlier Turkle 2002).

The initiative had a useful role in starting the discussion, and "could be understood in a more general way as a forum for exploring the future impact of all science and engineering" (Khushf 2004b). But it still serves as a vehicle for some highly idiosyncratic ideas, exhibits many biases and overly opinionated views, and suffers from a lack of forthrightness with regard to its proximity to "transhumanist" and other radically futuristic thinkers. Overall, the initiative is technology-driven, seems to be heavily influenced by new governmental perspectives on national security after 9/11, and conceals that many of the assumed technical breakthroughs presuppose scientific knowledge and technological capabilities that will very likely not be available in the foreseeable future. Cognitive science is crucial for achieving most of the technological visions but its opportunities and limits are least addressed. Discussions of ethical, legal or social issues related to NBIC are largely avoided. Assessments of hazards and risks as well as the discussion of values and moral boundaries are missing. Among the most serious flaws are the technocratic understanding of society and culture, the dubious evocation of the renaissance, the vision of a perfect future, the carefree siding with the proponents of a neural turn in social sciences and humanities, the alarmingly deep fascination with man-machine-symbiosis, and a certain degree of disregard for diversity and for relevant research findings of other scientists and scholars.

4 Positions of the European High Level Expert Group – Analysis of the Report

HLEG (2004) starts the discussion by citing three rather futuristic passages from the NSF/DoC report (Roco, Bainbridge 2002), but then concentrates on the development of an alternative vision of CT. By doing so, HLEG avoided a direct critique of the US report – a prudently chosen modus operandi, given the report's highly problematic features, the complicated US context of the NBIC initiative, and the short length of time at the HLEG's disposal

In its discussion of the potentials, limits and implications of convergence, the HLEG reacted both implicitly and explicitly to the abovementioned problematic aspects of the US NBIC initiative:

- The report of the HLEG, perhaps mischievously, adds socio, anthro, philo, geo, eco, urbo, orbo, macro and micro to the four "big Os" in NBIC convergence and proposes a distinctively European concept for convergence, which it calls CTEKS, standing for Converging Technologies for the European Knowledge Society. A major aim of this concept is to advance the so-called Lisbon agenda, the European path to the knowledge society.
- The group developed its own definition of converging technologies: "Converging technologies are enabling technologies and knowledge systems that enable each other in the pursuit of a common goal" (p. 14). While this definition is very broad, at least nanotechnology, biotechnology and information technology have undisputed key roles in convergence. Their mutual enablement is characterized as evident. In addition the HLEG argues for a special role for the social sciences and humanities, including cognitive science in this category rather than in a group with the NBI part of convergence. It also refrains from hastily taking sides in the emergent new round of debate over free will versus (neuro)determinism.

- HLEG stresses the importance of specific societal needs that must be identified in order to take advantage of and preserve Europe's cultural diversity and to create economic opportunity. Social sciences and humanities should provide orientation where CT could disrupt traditional ways of life, serve as intermediaries between political actors, CT researchers and society, and help to assess risks. The report obviously appreciates the methodological and theoretical diversity of social sciences and humanities as a reflection of the cultural and political diversity of modern societies. Moreover, these disciplines are seen as enablers for a human-centered and demand-driven CT applications design.
- The HLEG favors an approach to CT that prioritizes "engineering for the mind" as opposed to "engineering of the mind". It is skeptical towards brain-machine interfaces and brain implants to enhance mental capabilities and recommends instead the development of tools that can support and improve social interaction and decision-making in a diverse Europe and for ageing societies. The HLEG takes a reserved stance on technological enhancements of mental and physical capabilities that could create a divide between enhanced and non-enhanced humans – with the latter being increasingly perceived as "imperfect" or inferior. Furthermore the HLEG report warns that an idea of man as machine could lead to a mechanistic world in which there is no genuine moral choice. One may add that far-reaching transformations of the human body by technological means would raise questions of identity, e.g. with respect to the distinction between "having" and "being a body" ("Körper" and "Leib", as in the phenomenological tradition).
- The report includes a set of recommendations for European policy concerning CTEKS, including quite ambitious endeavours, such as an initiative to widen circles of convergence (WiCC), starting with the creation of a coordinating office. Although very good as a starting point for a debate on challenges arising from current developments in science and technology, further reflection on and elaboration of some of the ideas would have been helpful.

5 Structure of the conference

Following an introductory session with speakers from the commission and the HLEG, there were sessions on understanding convergence and the process of convergence which mainly featured presentations by members of the HLEG and of similar activities elsewhere. A similar format was employed by sessions on the next day which examined opportunities for Europe from the new technology wave and discussed new research models. Then followed a panel session involving speakers from various commission services on the role of converging technologies in the current EU research policy framework. The closing session was a summing up, in particular, on implications for European research policies.

6 Notes on the sessions

The major differences between the European CTEKS and the US American NBIC are perhaps that CTEKS are conceived as a bottom-up approach, starting from societal needs and involving many scientific disciplines other than the core of three or four (depending on the strategic importance of cognitive science), while NBIC has a strong focus on the improvement of human capabilities and performance, fuelled no doubt by military and security concerns, and is concentrated on the three established "big Os" (Nano, bio, info) and a promising newcomer (cogno). The US program is also extremely ambitious, culminating in the declaration of a "new renaissance" of science and including such projects as "mapping the human cognome" or "memetics" as a new scientific discipline, designed to overcome perceived dead-ends in the social science. The European program has no such ambitions and cautions against unbridled technological optimism. The HLEG proposes the involvement of social sciences and the humanities from the outset to consider societal needs and concerns (*Bruland, Nordmann* in their presentations).

Cognitive sciences are seen as a key field for CTEKS, which should receive greater attention at the European and national levels. The cognitive sciences are marked by a high degree of interdisciplinarity and include areas of psychology, neuroscience, linguistics and philosophy with important impulses coming

from the social sciences. In the past much attention was given to artificial intelligence (AI) which, depending on perspectives, can be seen as an area of cognitive sciences or as a separate endeavour which uses many results from the cognitive sciences. There was great interest in AI in the late 1980s and early 1990s which ebbed, when promised spectacular progress did not take place. At the moment, neuroscience is at the forefront of cognitive sciences. Cognitive science is making a major contribution to the understanding of the human as a social being which is essential for the construction of converging technologies if these are not to be misused or suffer rejection (presentation by the philosopher and cognitive scientist Daniel *Andler*).

The NBIC initiative has also attracted the attention of its northern neighbour, Canada, which concerned itself with convergence in its own pioneer foresight study on "Biosystemics", the Canadian variant of convergence, which gives special attention to ecological science in addition to the NBIC quartet. Correspondingly, the Canadian foresight program has devoted special attention to health-related applications, materials science, food system integrity and disease mitigation (presentation by Canadian Foresight director Jack *Smith*).

No doubt because of the military connotations of the American NBIC concept, there are concerns that the social aspects of convergence might be of even greater importance and more controversial than in such cases as genetic engineering. Since societal attitudes in Europe towards CTs are uncertain, due not least to lacking awareness at present, it is extremely difficult to undertake any kind of risk assessment, additionally so, since experts are few and far between (presentation by Raoul *Kneucker*). In the US, social science on nanotechnology is part of the program outlined in the "21st Century Nanotechnology Research and Development Act" (108th Congress, 1st Session, p. 189, signed by the President on December 3, 2003) with funds earmarked for the purpose. In the NBIC report (Roco, Bainbridge 2002), there is a proposal to actually train social scientists in the NBIC sciences during their professional education.

A problem arising from visions for perfecting humans through NBIC is the ethical question of the acceptance of imperfection, such as disabilities of physical or mental nature, i.e. a "right to imperfection" which is being debated in philosophical circles. There is also doubt about the adequacy of the existing legal framework to deal with questions arising from the availability of products of converging technologies, .e.g. "right to life", privacy concerns or the right to access of certain products in health care.

Convergence is already taking place in such concepts as "ambient intelligence", which relies heavily on nanotechnology to enable cognition (presentation by José *Encarnação*, Chairman of the Information Society Technologies Advisory Group (ISTAG)).

A recurring theme in the conference was the need for cooperation between scientific disciplines in such endeavours as CTEKS. There are various kinds of such cooperation, including multidisciplinarity, where each discipline as assigned its own tasks and there is mainly an exchange of results and transdisciplinarity, where cooperation is closer necessitating an exchange on approaches, underlying assumptions, concepts etc. to be successful (Eleonora Barbierie *Masini*). There was seen to be a need to embed socio-economic aspects in technological development.

The development of CTEKS in four different scenarios for the future development of Europe was discussed, with each scenario producing different accents with respect to the development and application of CTEKS.

There was a recommendation to emphasise European values in the development of CTEKS, such as solidarity, justice, cultural diversity and plurality, employing constructive technology assessement (Jan *Staman*). Another recommendation concerned the justification of decisions on technology policy by decision makers, such as the European Commission (Françoise *Roure* in her presentation). Concerns and worries could be used to advantage in conceiving new research. New roles emerge for disciplines that are traditionally focussed on regulation issues and gatekeeping functions. E.g. toxicology may serve as a point of information that allows you to generate more biocompatible materials – the US chemist Vicky Colvin was cited. In a similar way, social sciences could be used to generate more socially and culturally beneficial technologies (*Nordmann*).

Presentations from commission officers showed that much research which could fall under the heading of CTEKS in future is already in hand in the sixth framework program.

7 Prospective Outlook

Much space in the report of the HLEG is devoted to issues of interdisciplinary work which are obviously of great importance but not restricted to convergence of the type which was the subject of the report. There is thus a need to discuss various approaches to integration of relevant disciplines, such as education of social scientists in the NBIC disciplines as proposed in the NSF/DoC report (Roco, Bainbridge 2002), or the concept of "embedded social scientists" as being implemented at the Nanoscience Centre at the University of Cambridge (UK) (Wilsdon 2004).

In further work, it might be helpful not only to analyze the US NBIC visions in greater depth, but also to put them into perspective. The 2002 NSF/DoC report should not be treated as an isolated document, but seen within the context of US and international debates on NBIC and other enabling technologies and knowledge systems. As the US debate seems to be heavily influenced by two poles – an "extremely conservative reluctance" and a "quasi-religious embracement" of CT (Baird 2003) – it may be possible to learn from these highly polarised discussions.

In some senses the NBIC debate is reviving many of the arguments exchanged in the late 1980s – early 1990s debate on artificial intelligence, in which Hans Moravec published a controversial book with the title "Mind Children" (Moravec 1988), which contains many central arguments of the "trans-humanists". Moravec's and Ray Kurzweil's mentor, Marvin Minsky, a pioneer of artificial intelligence from the 1950s on, in fact argues for a central role for nanotechnologies in a 1994 article for the "Scientific American" asking the provocative question "Will robots inherit the Earth?": "…our nanotechnologies should enable us to construct replacement bodies and brains that won't be constrained to work at the crawling pace of 'real time'" (Minsky 1994). At this time, there was also a lively debate in parts of Europe on many aspects of artificial intelligence fuelled largely by public and industrial interest in "expert systems". At the time, a distinction was made between applications designed to replace human beings (experts) and those designed to support them. Many of the issues discussed then are resurfacing in connection with NBIC, so it is instructive to revisit the debate ongoing at that time for lessons which can be learnt – especially against the background of a developing societal framework and changing individual perspectives on and growing societal acceptance of new medical and pharmaceutical opportunities like cosmetic surgery or drugs to improve muscle mass and endurance as well as moods, attention or memory.

Besides the ethical and social concerns which are the topic of a drifting debate about CT, there are major doubts about the technological feasibility of many CT applications discussed in the various reports. Although science and technology have made enormous progress in the NBIC fields over the last years, many of the underlying fundamental processes of nature still are not sufficiently understood. Information on the state-of-the-art of related technologies is highly fragmented and often not transparent (since many research efforts in these fields are funded by defense research programs). Progress reports more often than not seem to be biased because of commercial interests, undisputed facts and widely accepted research results are rare. There is a clear need for reliable and well-structured information on opportunities, challenges and limitations for CT, linked with foresight activities and an analysis of the actual relevance of CT for research policy. Interestingly enough, the political discussion on CT shows signs of the same paradox as the debate on nanotechnology. Much simplified: "It is not clear, what it really is, what it will enable and where it will lead to, but in any case it is very important and will have enormous impact". Moreover, the atmosphere in the US now seems to be rather poisoned: In "transhumanist" and other technophile circles the members of the US President's Council on Bioethics are often seen as reactionary fanatics. A member of the Council, Francis Fukuyama, recently characterized "transhumanism" as one of the world's most dangerous ideas. There is still a real danger that the loudest voices will shape the public debate.

In any case, it would be unwise to model a European approach to CT only in opposition to a single US initiative or by adapting some of its elements in a European context without careful consideration: Shared cultural roots - like older occidental traditions - as well as the specificities of US and European societies and historical experience have to be taken into account. Otherwise relevant human, ethical and social aspects of CT and their potentially disruptive qualities may be neglected. A critical appraisal of US discussions may also help to avoid a biased perception of the US cultural climate, the scientific state of the art and the similarities and differences between Europe and the US with regard to CT. Rational curiosity about the synergistic effects of new technologies, coupled with historical and ethical awareness, seems to be the stance that is most appropriate for the forthcoming discussions.

* Most of the material is available at the Conference website (NTW 2004)

Bibliography

Bainbridge, W.S., 2004: The Evolution of Semantic Systems. In: Roco, M.H.; Montemagno, C.D. (eds.): The Coevolution of Human Potential and Converging Technologies, op. cit., pp. 150-177

Baird, D., 2003: Testimony at a Full Committee Hearing on Nanotechnology of the US Senate Committee on Commerce, Science, and Transportation. 01.05.2003 http://commerce.senate.gov/hearings/testimony.cfm?id=745&wit_id=2012 (17.11.2004)

Bond, P.J., 2004: Vision for Converging Technology and Future Society. In: Roco, M.H.; Montemagno, C.D. (eds.): The Coevolution of Human Potential and Converging Technologies, op. cit., pp. 17-24

Canton, J., 1999: The Social Impact of Nanotechnology: A Vision to the Future. In: NSTC-IWGN (ed.): Nanotechnology Research Directions. Workshop Report, The National Science and Technology Council's Interagency Working Group on Nano Science, Engineering, and Technology, workshop on January 27-29, 1999, pp. 178-180 *(chapter 11.7.13)* http://www.wtec.org/loyola/nano/IWGN.Research.Directions/IWGN_rd.pdf (17.11.2004)

Canton, J., 2004: Designing the Future: NBIC Technologies and Human Performance Enhancement. In: Roco, M.H.; Montemagno, C.D. (eds.): The Coevolution of Human Potential and Converging Technologies, op. cit., pp. 186-198

Gorman, M.E., 2004: Collaborating on Convergent Technologies: Education and Practice. In: Roco, M.H.; Montemagno, C.D. (eds.): The Coevolution of Human Potential and Converging Technologies, op. cit., pp. 25-37

HLEG – High Level Expert Group 'Foresighting the New Technology Wave', 2004: Converging Technologies – Shaping the Future of European Societies. By Alfred Nordmann, Rapporteur. Brussels

Khushf, G., 2004a: Systems Theory and the Ethics of Human Enhancement: A Framework for NBIC Convergence. In: Roco, M.H.; Montemagno, C.D. (eds.): The Coevolution of Human Potential and Converging Technologies, op.cit., pp. 124-149

Khushf, G., 2004b: The Ethics of Nanotechnology. Vision and Values for a New Generation of Science and Engineering. In: National Academy of Engineering (ed.): Emerging Technologies and Ethical Issues in Engineering. Papers from a Workshop, October 14-15, 2003. The National Academies Press; http://books.nap.edu/books/030909271X/html/29.html#pagetop (17.11.2004)

Minsky, M., 1994: Will Robots Inherit the Earth? Scientific America, October 1994

Moravec, H., 1988: Mind Children – The Future of Robot and Human Intelligence. Cambridge, Mass., London: Harvard University Press

NTW, 2004: Conference Website http://www.europa.eu.int/comm/research/conferences/2004/ntw/index_en.html

Paschen, H.; Coenen, C.; Fleischer, T.; Grünwald, R.; Oertel, D.; Revermann, C., 2004: Nanotechnologie – Forschung, Entwicklung, Anwendung. Berlin: Springer-Verlag

President's Council on Bioethics, 2003: Beyond Therapy: Biotechnology and the Pursuit of Happiness. Washington DC; http://www.bioethics.gov/reports/beyondtherapy/beyond_therapy_final_report_pcbe.pdf (25.11.2004)

RAND, 2001: The Global Technology Revolution. Bio/Nano/Materials Trends and Their Synergies with Information Technology by 2015. By Philip S. Antón, Richard Silberglitt and James Schneider. RAND National Defense Research Institute

Roco, M.H.; Bainbridge, W.S. (eds.), 2002: Converging Technologies for Improving Human Performance: Nanotechnology, Biotechnology, Information Technology and Cognitive Science. http://www.wtec.org/ConvergingTechnologies (17.11.2004)

Roco, M.H.; Montemagno, C.D. (eds.), 2004: The Coevolution of Human Potential and Converging Technologies. New York: New York Academy of Sciences (Annals of New York Academy of Sciences, Vol. 1013, May 2004)

Royal Society; Royal Academy of Engineering, 2004: Nanoscience and nanotechnologies: opportunities and uncertainties. RS policy document 19/04. London, July 2004

Strong, G.; Bainbridge, W.S., 2002: Memetics: A Potential New Science. In: Roco, M.H.; Bainbridge, W.S.: Converging Technologies for Improving Human Performance: Nanotechnology, Biotechnology, Information Technology and Cognitive Science. http://www.wtec.org/ConvergingTechnologies, pp. 279-286 (17.11.2004)

TAB – Office of Technology Assessment at the German Parliament, 2003: Summary of TAB working report No. 92 "Nanotechnology". http://www.tab.fzk.de/en/projekt/zusammenfassung/ab92.htm (07.11.2003)

Turkle, S., 2002: Sociable Technologies: Enhancing Human Performance when the Computer is not a Tool but a Companion. In: Roco, M.H.; Bainbridge, W.S.: Converging Technologies for Improving Human Performance: Nanotechnology, Biotechnology, Information Technology and Cognitive Science. http://www.wtec.org/ConvergingTechnologies, pp. 133-140 (17.11.2004)

Wilsdon, J., 2004: Nanotech needs to listen to its public, and now. Financial Times, 1 September 2004

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Mobilfunkbranche peilt auf dem Petersberg die Zukunft an

Zukunftsforum Mobiles Internet 2010, 14. - 15. September 2004

Tagungsbericht von Bernd Wingert und Arnd Weber, ITAS

Der Ort war gut gewählt, das Gästehaus der Bundesregierung auf dem Petersberg in Königswinter, denn er passte mit seinem prachtvollen Ambiente gut zu der wieder zu Optimismus neigenden Stimmungslage der Mobilfunkbranche. Die Konferenz war Gelegenheit zur Standortbestimmung, zum Rückblick auf bisherige Entwicklungen und das darin Versäumte, wie zum Ausblick auf komplexer werdende Infrastrukturen und ein unübersichtlicher werdendes Feld von Akteuren.

Die Konferenz versammelte weit über 300 Teilnehmer: Mobilfunkbetreiber, Chip- und Gerätehersteller, Dienste- und Inhalteanbieter, auch die universitäre und außeruniversitäre Forschung waren vertreten. Es ging, wie der die Ministerin vertretende Staatssekretär Dudenhausen einleitend betonte, u.a. darum herauszufinden, für welche Ideen und Entwicklungen die im kommenden Jahr zur Verfügung stehenden F+E-Mittel (30 Mio. Euro) eingesetzt werden sollen. Dudenhausen forderte dazu auf, sich die präsentierten Projekte anzusehen, die dann am interessantesten seien, wenn sich Gebiete überkreuzten, wie z. B. Telekommunikation und Nanoelektronik. Die heutige mobile Kommunikation sei erst durch die Nanoelektronik möglich geworden, „und zugleich ist heute die Mobilkommunikation ein Hauptmotor für die Nachfrage nach Nanoelektonik". Forschung und Industrie sollten enger kooperieren.

Für uns war die Tagung Gelegenheit, eine Zwischenbilanz zu unserem Forschungsprojekt über „i-mode" (das unter dem Programm für Innovations- und Technikanalysen des BMBF gefördert wird) auf der Postersession zu präsentieren (http://www.itas.fzk.de/deu/projekt/webe0333c.htm).

1 Struktur und Themenblöcke

Die Konferenz ging über zwei Tage; es gab am ersten Tag eine ‚Keynote' von René Obermann (Vorstandsvorsitzender der T-Mobile International AG), und am folgenden Tag sogar zwei Keynotes, die erste von Thomas Ganswindt (Siemens, IuK-Netzwerke), die zweite von Jeffrey Funk (Hitotsubashi University, Tokio). Die Beiträge am Nachmittag des ersten Tages waren den Themen „Infrastruktur" und „Endgeräte" gewidmet.

Nach den beiden Keynotes des zweiten Tages waren „Internationale Trends" Gegenstand der Betrachtung, danach „Anwendungsfelder und Geschäftsmodelle". Am Nachmittag ging es erneut um Infrastrukturen, nun aber explizit um „Mobile Netze der Zukunft".

Da es wenig informativ wäre, alle Beiträge mit der gleichen Intensität zu beleuchten, wählen wir aus und sparen die Sektionen über ‚Gerätetechnik' und jene zu ‚Anwendungen' ganz aus und gehen auch innerhalb der Sektionen nicht auf jeden einzelnen Beitrag ein.