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technology › analysis › innovation

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Program

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Thursday, November 13, 2008

until 12:00 noon	**Arrival and registration**
until 1:00 pm	**Refreshments**
1:00 pm	**Address of welcome and opening**
1:15 pm	Introductory speech: „Efficient Marketing of Sector-Specific Innovations" by *Dipl.-Ing. Manfred Rink,* Bayer MaterialScience AG, Leverkusen
1:45 pm	**Division into the session rooms**
2:00 to 5:30 pm	**Four parallel sessions** • Session 1 — Self-organisation as a challenge for science, industry and politics • Session 2 — The future of participation: from civic participation to „open innovation"? • Session 3 — Technical knowledge: education for innovations or innovations in education? • Session 4 — Anticipation through simulation: technical, natural and social systems

Friday, November 14, 2008

9.00 am	**Address of welcome**
9.15 am	**Keynote speech** by *Klaus Burmeister,* Z_Punkt GmbH, Cologne
10.00 am	**Round Table with** *Dr. Dr. Axel Zweck,* Future Technologies Consulting Division of the VDI Technology Center, Düsseldorf *Dr. Philine Warnke,* Fraunhofer Institute for Systems and Innovation Research (ISI), Karlsruhe *Prof. Dr. Daniel Bieber,* Director of the iso-Institut, Saarbrücken, and lecturer at the University of Heidelberg's Institute of Sociology *Prof. Dr. Armin Grunwald,* Institute for Technology Assessment and Systems Analysis (ITAS) of the Karlsruhe Research Center, part of the Helmholtz Association *Dipl.-Ing. Manfred Rink,* Bayer MaterialScience AG, Leverkusen *Klaus Burmeister,* Z_Punkt GmbH, Cologne Moderation: *Thomas Ramge,* journalist, Berlin
12.00 noon	**Summary, outlook and closing remarks**

Details on the sessions

Session 1 – Self-organisation as a challenge for science, industry and politics

The idea of self-organisation is found increasingly often in roadmaps describing potential developments in specific technical application areas. Technical systems, production and control processes are now being equipped with the ability to continue to develop themselves: engineers no longer create technology that they then expand upon, but instead only create the foundation on which the technology „grows" in a self-organised fashion.

In nanotechnology, bionics and information and communications technologies, it is already possible to construct adaptable and intrinsically safe systems. Technological development is still in its fledgling stages, but a fundamental change in the way technology is developed can already be seen.
The consequences are far-reaching and also affect political and economic processes. The development of technology can no longer be handled by established forms of governmental regulation and poses new questions: how do legal regulations need to be adapted in order to be able to control self-organised technology development? Will it be possible to regulate technologies and technological developments that transcend disciplinary boundaries using control instruments that were created for individual application areas? How can independently growing processes be integrated into the operational processes of businesses?

Session 1 will be moderated by Dr. Dr. Axel Zweck, of the Future Technologies Consulting Division of the VDI Technology Center in Düsseldorf, and has the aim of showing how science, industry and politics can react to self-organisation and adequately direct it.

1st presentation – Self-organisation in bionics: the change of an overall concept

Background: Bionics brings together various technical developments within the concept „learning from nature".
With the development of nanobionics, this concept has been expanded to include the aspect of self-organisation. This expansion of bionics is reflected in concepts such as an environmentally friendly and thrifty „green chemistry" or „soft nanotechnology" with minimised risks. This requires a shift from a technology that functions intelligently but is often astonishingly simple towards a technology that is flexible and is built on principles that prevent undesired (mal) functions.
Objective: The group will discuss how self-organisation affects the sciences, leading to new concepts and focus areas for research.

Prof. Dr. Thomas Speck, Plant Biomechanics Group Freiburg – Botanical Garden of the University of Freiburg

2nd presentation – Self-organisation in information technologies: integration into economic processes

Background: Organic computing also examines processes in nature, including emergent and self-organised behaviour, such as the swarming behaviour of insects, which possesses its own logic and intelligence. It tries to discover which mechanisms are responsible for ensuring that systems in turbulent environments can remain stable and adaptable. How do these systems make use of errors to learn collectively (like a swarm)? How can we program emergent systems whose individual parts are familiar, but in which the true importance lies with the behaviour involved in the interaction of the parts?
These questions have not yet been answered, but the answers are expected to lead to great benefits, also from an economic point of view. However, these benefits will (probably) also involve risks.
Objective: On the basis of examples, the group will discuss how self-organisation can be incorporated in technical applications and, despite its dynamism, be integrated into controlled production and service processes.

Ulrich Petschow, Institute for Ecological Economy Research (IÖW), Berlin

3rd presentation – Self-organisation in nanotechnology: new approaches to regulation

Background: Nanotechnology combines synthetic chemistry, materials sciences, engineering and biotechnology. It creates new possibilities at the crossroads between different disciplines, but also poses new safety risks. These include chemically toxic substances and the problem of specific, size-dependent characteristics of nanosystems and units with uncontrolled growth properties and their effects on the environment.
Such safety issues cannot be handled through regulations or by institutions specialising in individual areas of technology. They require integrative regulatory instruments and procedures.
Objective: The group will evaluate existing regulatory instruments and formulate the requirements for new and improved instruments.

Dr. Andreas Lösch, University of Darmstadt and University of Basel

Session 2 – The future of participation: from civic participation to „open innovation"?

The development of technology and the assessment of its consesequences have always been accompanied by methods of participation: consensus conferences, round tables and citizens' fora address subjects from the areas of science and technology in order to integrate people's opinions into decisions or at least to make decision-makers aware of people's concerns. Participating in such events may well end in disappointment in most cases, as the results and recommendations made rarely have an influence on the actual decision-making process.

But still: innovation research is increasingly learning to see people's active participation in the innovation process as a prerequisite for implementing innovations. Opening up innovation processes, or „open innovation", aims to pave the way from discovery to market success.
What conditions and structures distinguish current innovation processes from traditional decision-making processes in the area of technological development? Once these conditions and structures have been described, we can begin to examine how „open innovation" might be organised in such a way as to ensure that plans to open up the innovation process don't remain empty promises.
Participation and „open innovation" have one thing in common: they give people the opportunity to take part in decision-making processes without delegating the actual decisions to them. This is what distinguishes these models from direct democracy, in which participants are responsible for making the actual decisions. However, as the example of Switzerland shows, even countries with systems of direct democracy use participational procedures. It is worth taking a look at how the relationship between direct democracy and participational procedures is organised, as this can provide general insights into the opportunities and limitations of civic participation.

Session 2 will be moderated by Dr. Philine Warnke, of the Fraunhofer Institute for Systems and Innovation Research (ISI) in Karlsruhe. It aims to clarify the relationship between traditional participation in innovation processes and „open innovation", identify potential organisational models for „open innovation", and build bridges between civic participation and political decisions.

1st presentation – Open innovation: opportunities for more societal participation in questions of sustainability?

Background: The demand for participation in technology development is based on democratic political as well as functional arguments. Participatory approaches of technology assessment should not only enhance the legitimacy of technology policy decisions but also make the experience and local knowledge of the population available for technical development. Approaches of participatory technology development, however, aim primarily at improving the „social integration" of new products. Potential users are involved actively in the design of technology.

Sustainability as a guiding principle of technology design increases the demands on innovation processes. In addition to traditional criteria such as usefulness, efficiency or environmental sustainability considerations appear for e.g. demands for social justice under long-term global perspective. Thereby the question of societal participation in technical innovation processes gains more and more importance. Is the concept „open innovation" as new dealings with innovation relevant knowledge, able to offer additional perspectives and starting point?

Objective: The participants will discuss the idea of „open innovation" against the background of previous participative programmes and will evaluate its chances of expanding upon or replacing them.

Dr. Michael Ornetzeder, Institute of Technology Assessment, Vienna

2nd presentation – The transferability of open source and open innovation to other industries

Background: Open source software development is well established, and software created by open development communities has shown a high level of performance and competitiveness in comparison with commercial solutions. Can open source be the „prototype" of open innovation processes in other production areas? Or will attempts to transfer open source principles to the innovation process outside of software development fail because the prerequisites of open source, meaning the joint invention and design of solutions, cannot be satisfied for many products?
Objective: The participants will discuss forms of „open innovation" outside of software development and formulate criteria for transferring the concept to other industries.

Dr. Christina Raasch and Professor Dr. Cornelius Herstatt, Technical University of Hamburg-Harburg

3rd presentation – Public participation: from referendum to PubliForum – experiences from Switzerland

Background: In Switzerland, citizen participation in issues relating to science and technology is an established instrument for indicating public opinion. In Switzerland, referendums are used to make decisions about research subjects, making them an instrument of direct democracy that goes well beyond so-called „participative methods". In this way, the Swiss citizens have in recent years voted on matters such as animal experiments, genetic engineering, transgenic plants, reproductive medicine and stem cell research.
Objective: The participants will discuss whether and how the results of participation influence political decisions and what significance the Swiss experiences can have for civic participation in other countries.

Dr. Sergio Bellucci, managing director of the TA-SWISS office, Bern

Session 3 – Technical knowledge: education for innovations or innovations in education?

Innovation and education go hand in hand: scientific and technological performance is highly dependent on people's skills; in turn, innovation poses ever-increasing challenges to education. This is not a new development, but it is one that is gaining in importance with the increasing dynamism of the innovation process.

High technologies develop in a dynamic way and influence different application areas. Shorter product life cycles destroy mature relationships between users, manufacturers and service staff or prevent such relationships from developing in the first place. Nowadays, it is only possible to remain a specialist by undergoinng continuous further training. New qualification requirements arise all the time. The idea that initial training is enough to equip someone with the skills necessary for his or her entire working life is now only true in a very small number of professions.
This results in new demands on the education system. Suitable further training offerings must be developed at ever shorter intervals. The education system must (once again) focus more on teaching fundamental skills that provide a basis for lifelong learning.
The question of how schools and other educational institutions are connected to each other has been discussed for some time: in the context of technology skills, the concept of education chains (derived from production processes) has already emerged, in which each individual link is based on – and is the basis of – other parts of the education system. General educational offerings are the prerequisite for the success of the education system both at an individual level (teaching people to learn continuously) and at an economic and social level (securing the competitiveness of the national economy).
If a society's productivity is highly dependent upon knowledge, education becomes a valuable asset, and thus also a product. The economic incentive to market knowledge at an individual level is often at odds with the idea of creating knowledge collectively and coming up with innovations as a community. This paradoxical situation is reinforced by the possibilities offered by information and communication technologies.

Session 3 is moderated by Prof. Dr. Daniel Bieber, director of the iso institute in Saarbrücken and lecturer at the University of Heidelberg's Institute of Sociology. It will focus on the links between innovation potential and questions concerning the organisation of education. Examples will be presented to illustrate the various aspects of this interaction.

1st presentation – Cooperative technologies in the working world and in education

Background: Against the background of Web 2.0 technologies related changes in the lived-in world, requirements and opportunities for professional learning and work will be discussed. There is talk of new forms of participation and cooperation, other ways of representation, identity and changing potentials in information search and provision and cooperative development. The possibilities, chances and problems of designing work-related learning by using Web 2.0 and social software are to be focused. This will put an emphasis on the foundation of an understanding of media as

development tools for individual skills, and the question will be discussed, if collaborative technologies can contribute to design innovative learning environments.
Objective: The participants will discuss the innovation potentials of cooperative technologies in work and training.

Prof. Dr. H.-Hugo Kremer, University of Paderborn, Centre for Vocational Education and Training (CEVET)

2nd presentation – Challenges in technical education

Background: The field of technical education includes two complementary subject areas: on the one hand the teaching of functional, technical expertise in the narrower sense, and on the other hand disseminating basic technical knowledge among the general public. Both aspects presuppose and reinforce one another, a relationship similar to the one between recreational and professional sports. Technical education therefore represents a central prerequisite for innovative strength in technology which has been neglected in the past. In order to be able to identify existing hurdles and potential approaches in technical education, it is necessary to look at the entire educational chain, from the (pre)school level to vocational and academic education to adult education. This analysis can propose concrete courses of action.
Objective: The participants will discuss institutions of technical education and make suggestions for their improvement.

Prof. Dr. Ernst A. Hartmann, Institute of Innovation and Technology at the VDI/VDE Technology Centre Information Technology, Berlin

3rd presentation – Challenges and approaches for initial and continuing training in the area of microsystems technology and related high technologies

Background: Experience in the area of microsystems technologies has shown that close cooperation between stakeholders from education and industry can help ensure that that the formats and teaching plans in initial and continuing vocational training can be implemented effectively even in the face of reorganisation processes in the corresponding professions.
Objective: The participants will discuss the example of microsystems technology and compare it with related high technologies.

Dr. Dirk Rein, AMA Association for Sensor Technology, Göttingen

Session 4: Anticipation through simulation: technical, natural and social systems

Computer-supported simulations have established themselves as scientific methods, supplementing theory and experimentation. Experiments produce results with limited validity because they only record a small part of reality. Theory abstracts strongly in order to be able to make general statements about broader issues on the basis of very few variables. In contrast, simulation creates models of the behaviour of complex systems and their components by linking a great deal of data with the help of computers. This method could develop into a mediator between experimentation and theory because it pools their respective strengths.

The advance of simulation is linked to increasing computing performance and simultaneously sinking costs. As a result, it is now possible to examine complex research topics in a number of disciplines with the help of simulation. In this way, the development of technical components, the spread of epidemics, climate change and animal experiments can be simulated on the computer.
Simulations can re-enact many different objects and procedures. One of their strengths lies in the modelling of networks, because these are comprised of nodes and the relationships between them, and thus can reproduce the complex structures of many different systems. This works equally well for biological (sub-)systems such as individual organs or human beings, for the interaction between man and machine, and for activities within a social network. These examples from system biology, socionics and network analysis reflect the versatility and the opportunities offered by simulation.

Session 4 will be moderated by Prof. Dr. Armin Grunwald, of the Institute for Technology Assessment and Systems Analysis (ITAS) of the Karlsruhe Research Center, which is part of the Helmholtz Association. It has the aim of assessing the value of the relatively young method of simulation for various sciences and for the promotion of innovation.

1st presentation – Natural systems: system biology

Background: The biosciences primarily examine cell components and their functions with the help of qualitative and descriptive individual studies. However, in order to be able to gain knowledge about their role in the process of life, the results must be placed in a broader context. This is performed by system biology, an interdisciplinary research approach that includes the fields of biology, computer science, mathematics and system and engineering sciences. System biology processes the huge volume of existing data and organises it into computer models of physiological processes and organisms. By linking individual studies („wet lab") and simulations („dry lab"), it promotes an integrated, realistic view of life processes.
Objective: Participants will discuss the relationship between experimentation and simulation in day-to-day research activities in the field of biology and examine the question of what other disciplines can benefit from this combination of methodologies.

Prof. Dr. Dr. h.c. mult Willi Jäger, Interdisciplinary Center for Scientific Computing (IWR), Ruprecht-Karls University, Heidelberg

2nd presentation – Technical systems: socionics

Background: The relationship between man and machine is changing: the performance of programs and robots is improving and they are being used in an increasing number of different areas of life. It is therefore necessary to develop user-friendly and intuitive operation and behaviour concepts for these programs and robots: they must adapt to human actions, imitate societal behavioural patterns and be able to take existing relationships and roles into account. Socionics, as a combination of sociology and computer science, examines the future technical feasibility and potential industrial utilisation of such concepts. It investigates the most diverse areas, including logistics, flexible production, robotics, the administration of organisations, web services, infotainment, etc.
Objective: The participants will discuss the benefits and the potential applications of simulations for improving industrial cooperation between human beings and machines.

Prof. Dr. Hans-Dieter Burkhard, Humboldt University, Berlin

3rd presentation – Social systems: innovation networks

Background: Modern innovation policy promotes networking within research as well as between research and industry. Such innovation networks aim to link value-added processes more effectively. They can be seen as the social infrastructure of a knowledge-based society. But what types of networks are best suited to this task? Which innovation networks should be given political support? This question can be answered with the help of simulations, which model and test complex events in networks, showing how new knowledge is disseminated within a network and is accepted by its participants.
Objective: The participants will discuss simulation as a method of innovation policy and examine the question of which conditions are necessary for a successful innovation network and must therefore be included in simulations.

Dr. Harald Katzmair, FAS Research, Vienna / New York