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2020 Living in a Networked World Individually and Securely

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Needs and Prospects for Individuals in a Networked World

Our public, private and professional lives will become interrelated and dependent on technology. This will lead to a ‘networked world’ in which separate technologies will be systematically interconnected and adjusted to specific and individual needs. The Lead Vision of the German Futur initiative ‘Living in a networked world: individually and securely’ is based on an exploration of possible trajectories for these developments that take account of how the dual process of networking – networking between technologies as well as networking between human beings and machines – can be politically shaped and directed.

Lead Visions as a Way to Define R&D Priorities

The Lead Vision ‘Living in a networked world: individually and securely’ is party of the offspring of the *German Research Dialogue: Futur*. This dialogue was initiated by the German Federal Ministry of Education and Research and managed by IFOK. Through this research dialogue the Ministry tried to identify crucial topics for future research and public funding by an open, participatory approach. Four Lead Visions have already been identified. Apart from the Lead Vision presented in this Brief these were:

- ‘Smart Web’
- ‘Understanding Thought Processes’ and

- ‘Healthy and Vital throughout Life by Prevention’.

These visions provide signposts to guide research and help deal with the technological and social challenges to come.

More than 1500 experts participated in this programme so far; 1000 experts engaged in discussions on the Lead Vision: ‘Living in a networked world: individually and securely’.

The Personalized World of Interaction Goals and Prospects

The development and invention of new technologies – notably Information and Communication Technologies – already have affected our private, public and professional lives immensely.

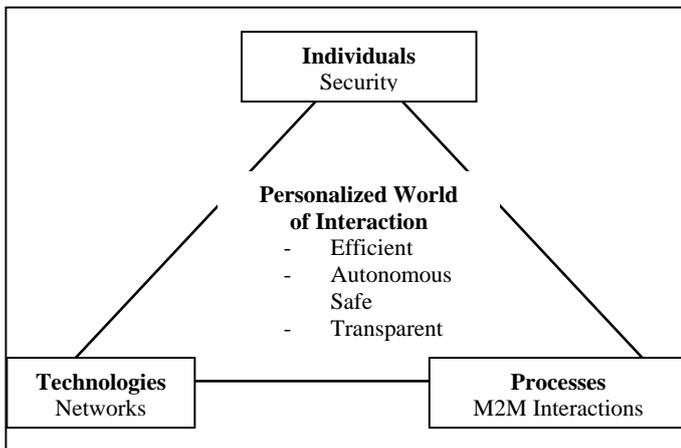


Until now we mostly use technologies such as mobile phones and computers, separately and independently from each other. What is still not adequately addressed however, is the fact that these technologies will become more and more interconnected. This will trigger a triple process.

The different spheres of our lives will become increasingly intermeshed and intertwined. The existing boundaries between our private, public, and professional lives will disappear. This will require technologies that can transgress limits. They have to be interconnected and turned into networks. In order to meet the social and individual demands these networks have to be ubiquitous. They have to be accessible at any time, from any place, and in any situation. In short, we will live in a networked world. Finally, these technologies have to comply with our personal needs and wishes. This pre-supposes a highly developed level of M2M-interaction and communication.

The aforementioned prospects define two primary goals of the Lead Vision:

- First, the Lead Vision wants to help to develop a digital network that meets the needs of their users. Autonomy and individuality of the users are crucial requirements that are to prevail over technical requirements. It is not the user that is to adapt to the technology but the technology to the users.
- Second, the Lead Vision endeavours to feature a technology that is in any sense reliable. The technological infrastructure will be invisible as well as accessible at any time. In addition, bi-directional information should be possible.



The Three Dimensions of this 'Personalized World of Interaction'

Overall, these developments will lead to a 'personalized world of interaction' that:

- Guarantees the security of its members
- Provides their members with a ubiquitous technological infrastructure, and
- Allows M2M-interaction.

That is process-oriented, able to learn, develop and adjust.

The outcome of the foresight process was that in a 'personalised world of interaction' the users will remain embedded in their social-cultural environment. The networked world will not create 'monadic' isolated individuals but will foster and sustain social networks. The networked world will serve a socially, professionally, and culturally active population. This Lead Vision points towards an interdisciplinary approach. It strives to combine concepts from the social sciences and cultural studies with research into new technologies.

Social and Economic Dimensions of the Networked World

According to the Lead Vision, the networked world will alter our life fundamentally. Networked systems will not just be tools to accomplish specific tasks. They will support our daily lives on an individual and personal basis. They will relieve us from routine tasks and fulfil encompassing functions.

The Lead Vision identified long-term trends that will determine the shape and the extent of the 'personalised world of interaction':

- Social and technical systems will become far more complex. In order to deal with this complexity individuals as well as the society in general will need assistance provided by the networks themselves. In addition, the technical systems have to be transparent and foster the autonomy of the users. The users have to be able to manage their environments in a flexible and self-determined way.
- Globalisation will bring about more communication and mobility. The networked world will have to provide us with the technological infrastructure in order to use these options in the best way.
- In the networked world intellectual property rights will become more important. We will have to think about how to protect these rights without undermining the positive effects of the network systems. 'Open Sourcing' and new modes of organisation will have to be established in order to secure these rights.
- This personalised world of interaction will be part of a society of knowledge. Lifelong learning will be a must for everybody.

On the other hand, the networked world has not only to comply with individual needs but also to guarantee other properties: it has to provide confidentiality, authenticity, and transparency as well as reliability and security.

The development of these technologies will help to create new jobs and strengthen Germany's competitiveness in the world market. They will solve social problems and lead to the creation of new and highly qualified jobs.

Methodology

The *German Research Dialogue: Futur* was organized in a participatory, bottom-up approach that included conferences, workshops and focus groups. Even though it was an open-

ended process, it still found consensus on a number of issues and provided guidelines for future research and policy.

What is true in general for Futur is true in particular for the Lead Vision **Living in a Networked World: Individually and Securely**.

Further Fields of Research

Technical Research

The Lead Vision has affected existing research and triggered new questions relating to: M2M-interaction, embedded systems, software agents, networks, the structure of services, and security.

Until now **M2M-interaction** is mostly based on the screen-keyboard-mouse principle. However recent developments in artificial intelligence and in micro-system technologies may provide new solutions and new modes for man-machine interaction. Relevant fields for future research in this area include communication, visualisation, sensor-technologies and energy supply.

- As far as **communication** is concerned the main problem is how to translate spoken words into a semantic model. Put another way, we need technologies that can understand what has been said and act upon this understanding. This line of research is still in its infancy.
- As far as **visualisation** is concerned a number of improvements already have been made. Simulation-techniques are used in a variety of fields such as augmented-reality-applications and virtual engineering. In addition to this new materials may one day lead to the use of flexible displays and intelligent reusable 'intelligent paper'.
- New **sensor-technologies** *have also* been developed. These enable interface techniques managed by head- or eye-movements, puffing etc. These techniques will facilitate future M2M-interaction. Other technologies will help both man and machine to better understand information as well as the situations that users may find themselves in.
- **Energy** is mostly supplied to devices using conventional batteries. Future research will explore new ways for providing energy to mobile devices using muscle movements for example.
- Finally new technologies will have to take into account how fast individual users can learn. This will determine the level of **support** that systems will have to provide.

- **Embedded Systems:** Already many tasks in everyday life are delegated to 'embedded systems' that guide the technical systems of cars, airplanes and buildings. Research is required on how existing technologies may be put into practice and further integrated with existing and future systems.
- **Software Agents:** By contrast with 'embedded systems' 'software agents' are autonomous. They are not embedded in other technologies. Software agents are like robots in that they may interact with other software agents on behalf of users. This raises a number of questions concerning interactions not only between software agents but between individuals and software agents. It raises questions about the legal consequences of these interactions such as 'who is liable if something goes wrong when a software agent acts on one's behalf?'
- **Networks and structure of services:** Global communication systems such as networks for television and broadcasting will interact with mobile and body area networks attached to individual users. The first steps in this direction have already been made. Video on demand and multimedia messaging are just early examples of such services.
- **Security:** A pivotal problem is to protect private and professional communication. This implies a need for cryptographic research as well as answers to questions such as how the sender of a message can definitely be identified. Even though technologies based on Public Key Infrastructure, digital signatures, biometrical identification and technologies for digital rights management are already in use, they lack practicability. They are inefficient and costly. Further basic research on security aspects is required.

Non-Technical and Interdisciplinary Research

Apart from all these issues that refer to the technological side of a networked world, the Lead Vision also addresses non-technical and interdisciplinary factors of the innovations being considered. First and foremost a networked world can only work if there are common policies, as well as technical rules and standards. This concerns legal issues such as copyright and other rights such as the right to encrypt messages and monetary issues such as the availability of micro-payment systems, and

issues such as protection of private data. Finally, the personalized world of interaction will have social, political, and cultural ramifications which will require interdisciplinary research to understand.

Implementation

The Ministry of Education already has started to act upon the guidelines laid out in the Lead Vision. Apart from programs such as Mikrosystemtechnik 2000+ that address specific issues, but which were not specifically designed for and triggered by this Lead Vision, a number of new dedicated projects are already being carried out.

As a first measure the Ministry of Education and Research set up the **Verisoft** project. This initiative will develop safety-standards for Information Technologies. It will roll-out over an eight year period from 2003 until 2011 and has so far received €7.2M. It is lead by the University Saarland, administered by the Deutsche Zentrum für Luft- und Raumfahrt and is being carried out in cooperation with the Technical Universities in Darmstadt, Karlsruhe and Munich as well as with the German Research Centre for Artificial Intelligence and the Max-Planck-Institute in Saarbrücken. Industrial partners include Infineon Technologies, T-Systems Nova, BMW and Absint.

Another project entitled **SicAri** started in October 2003. It is funded for four years with €5.3M and will develop a software-package that allows safe IT-communication.

MIND a third project funded by the ministry with €2.4M tries to improve computer and network security. MIND signifies 'Machine Learning for Intrusion Detection' and the aim is to identify as quickly as possible any attempt to compromise an IT system made by an internal or external intruder. This project is being carried out by the Fraunhofer First institute, Intelligent Data Analysis, Siemens Corporate Technology, and IT Service Omikron.

Finally, the project **SmartWeb** will develop software able to comprehend the content of sentences and answer questions. This work will last from 2004 to 2007. The goal is to lay the foundation for multimodal user interfaces to distributed and composable semantic Web services on mobile devices. It has received €13.7M. The academic partners are the DFKI as consortium leader with Fraunhofer Gesellschaft, FIRST, ICSI, and universities from Erlangen, Karlsruhe, Munich, Saarbrücken and Stuttgart. The industrial partners are BMW, DaimlerChrysler, Deutsche Telekom, Siemens, EML, Ontoprise, and Sympalog.

Conclusion and Policy Implications

This Foresight initiative has had a significant impact on the policy agenda of the Federal Ministry of Education and Research. As a result of this Foresight initiative new projects have been set up and are already being carried out. The Lead Vision technique can therefore be considered a success-story with regard to the methods and impact of the Foresight approach.

So far the policy implications are one-sided though. Even though the Lead Vision strongly indicated the need for interdisciplinary research, the projects funded by the Ministry are mainly technology oriented. Social, economic, or cultural aspects of technological development are not yet addressed and are not yet reflected in projects supported by the ministry. Important issues such as demographic effects and the fact that we are living in a socially and culturally heterogeneous society are not yet being considered.

Sources and References

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About the EFMN: Policy Professionals dealing with RTD, Innovation and Economic Development increasingly recognize a need to base decisions on broadly based participative processes of deliberation and consultation with stakeholders. One of the most important tools they apply is FORESIGHT. The EFMN or European Foresight Monitoring Network supports policy professionals by monitoring and analyzing Foresight activities in the European Union, its neighbours and the world. The EFMN helps those involved in policy development to stay up to date on current practice in Foresight. It helps them to tap into a network of know-how and experience on issues related to the day to day design, management and execution of Foresight and Foresight related processes.