WP 1 – Review and Analysis of National Foresight

D1.1DE – Case Study

Germany – Futur, Der Deutsche Forschungsdialog 2001-2002

Status: Public

Partner Responsible:

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Date of Preparation: 15 April 2003

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WHAT IS FISTERA?

FISTERA is a Thematic Network on Foresight on Information Society Technologies in the European Research Area.

The **FISTERA** network is supported by the European Community under the FP5 specific program for research, technological development and demonstration on a user-friendly information society (1998-2002).

The aim of the FISTERA Thematic Network is bring together on a systematic and extended basis, actors and insights in national foresight exercises on IST in the Enlarged Europe.

Main objectives:
- ♦ Compare results of national foresight exercises and exchange visions on the future of IST
- ♦ Provide a new forum for interactive consensus building on future visions for IST
- ♦ Contribute to the European Research Area through benchmarking and community building, by providing a dynamic pan European platform on foresight on IST

In order to meet these three key objectives, FISTERA will:
- ♦ Review and analyse the national foresight exercise outcomes (a country synthesis report)
- ♦ Build aggregate pan European Technology trajectories (a roadmap of potential developments of key emerging technologies)
- ♦ Map the European IST actor space (an analysis of the EU IST actor space)
- ♦ Provide an IST Futures Forum (strategically selected scenario exercises that will look at wider aspects of applications of IST)
- ♦ Disseminate the results to a targeted audience by various means (a dynamic website at the address http://fistera.jrc.es, an e-mail alert service, publications, conference presentations, a "road-show" of workshops and a final conference)

Network Membership:
Core partners (coordinators, work package leaders):
- JRC-IPTS (Institute for Prospective Technological Studies), part of the European Commission's Joint Research Centre, Scientific Coordinator of the network.
- FZK - ITAS (Forschungszentrum Karlsruhe GmbH in der Helmholtz-Gemeinschaft, Institut für Technikfolgenabschätzung und Systemanalyse), Germany.
- TILAB (Telecom Italia Lab – Scenarios of the Future), Italy.
- ARC/sr (ARC Seibersdorf research GmbH, Division Systems Research Technology-Economy-Environment, Seibersdorf), Austria.
- PREST (Policy Research in Engineering, Science and Technology) of the University of Manchester, United Kingdom.
- GCI (GOPA - Cartermill International), Belgium, Administrative and Financial Co-ordinator.

The group of **Members**, which is expected to grow over the duration of the contract, currently includes the following organisations: TNO-STB (The Netherlands), Danish Teknologisk Institut (Denmark), TecnoCampusMataró (Spain), Observatório de Prospectiva da Engenharia e da Tecnologia-OPET (Portugal), ARC Fund (Bulgaria), IQSOFT (Hungary), Tubitak (Turkey), The Researchers' Association of Slovenia (Slovenia), NMRC, University College Cork (Ireland) and BRIE-Berkeley University (USA). In addition, McCaughan Associates (McCA) runs a group of High-level Experts to the Network Management Committee.

FISTERA Web site: http://fistera.jrc.es/

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Summary

This exercise took place from 2001 to 2002, with a pilot phase several years earlier. The goal is to formulate visions for programmes operated by the research ministry (BMBF). It has a strong participatory element, attempting deliberately to engage certain societal groups (young people, women, artists, journalists) in the dialogue to provide input for the strategic research funding policies of the BMBF by means of an orientation towards societal goals. "Futur" has a very open approach and the exercise amounts to a selection process cascading from the very broad to quite narrow focus. The time horizon is 20 years and methods include workshops, open space discussions, panels, scenarios and lead visions, future workshops, electronic communication (online-voting) and road shows. Main outcome of Futur were four guiding visions. In all four guiding visions, aspects of IST are more or less relevant, but none of these visions are in a classical sense IST themes. This results the demand driven approach of the formulation of research themes.

1   Background and Objectives

In the early 90s Germany started a couple of foresight like activities (Dietz 2002, p. 4 ff.; Meister et al. 2001, p. 5 ff., Cuhls 2001). The first German Delphi-Report was conducted from 1991 to 1993, commissioned by Federal Ministry of Research and Technologies (BMFT). In the same period, a study "Technologien am Beginn des 21. Jahrhunderts" took place (Grupp 1993, 1994). A so called "Mini-Delphi" was carried out in 1994 and 1995 in Japan as well as in Germany (BMBF 1996). The second German Delphi took place from 1996 to 1998 (Cuhls et. al. 1998).

Following the replacement of the former conservative Kohl-government by the newly elected "red-green" government the German BMBF started in 1999 a pilot, which dealt with two subjects "mobility and communication" and "health and quality of life" (Meister et al. 2001, p. 7). This had been influenced by international developments in the field of foresight which integrated a more participatory and dialogue-oriented approach as well as an approach which is more oriented towards social demands than technological proposals or promises. A central element was an electronic discussion space via Internet. It was to be used to discuss in an open and public dialogue the main technological and social trends in the two mentioned fields. Reflecting the weakness of this approach, "Futur: The German Research Dialogue" was established in 2001. The objective of Futur was to provide input for the strategic research funding policies of the BMBF.

Main aims of Futur are (cited from the Futur website):

- Orientation towards a societal goal, for instance solving a pressing problem of society,
- Connection of the needs of the society with technological and social innovation,
- Contribution to strengthening Germany as a site of economic production,
- High degree of complexity and interdisciplinarity,
- General comprehensibility.

2   Organisation of the Foresight Exercise

The Federal Ministry of Education and Research entrusted a consortium with the organisation of "Futur". The "Futur" consortium had the responsibility to organise an open and creative process between experts and the public, but it was to be neutral relating to contents. The consortium was the organiser and moderator of the "Futur" process.

BMBF wished to implement the results of "Futur", so it was important for the ministry to be involved in strategic decisions on the "Futur" process. To establish a balance between the openness of the discourse and the practical demands of the ministry, which needed some steering action, was a difficult but necessary task. The role of the research administration increased gradually from stage to stage.

The active participants of Future consisted of two groups: an inner circle and an outer circle. The inner circle consisted of about 850 persons. Its role was to participate actively in the workshops, conferences and other events of Futur. The outer circle consisted of about 600 persons and its main task was to comment and evaluate the proposals of the inner circle via an online voting-instrument with a return rate of 25 percent (Banthien et al. 2002, p. 33). The intensity of involvement in the process was quite uneven, extending from merely passive monitoring to active work in workshops (Dietz 2002, p. 10).

The participants in "Futur" consisted of a broad spectrum of persons from different parts of society: scientists, entrepreneurs, representatives of associations and social institutions and artists. Special emphasis was put on having young scientists and women (almost one third) among the participants. The aim of having one third from science, one third from industry and one third from the remainder of society was not achieved. The participants from science formed the vast majority, while the participants from industry came mainly from big business (Banthien et al. 2002, p. 35).

3   Method and Procedure

"Futur" started in July 2001 with 9 workshops involving nearly 400 experts. The outcome of this first stage of "Futur" was a collection of 10,000 topics, many redundant, dealing with societal problems and possible solutions of science (Dietz 2002, p. 11).

The "Futur" Consortium evaluated this collection and presented a list of 21 packages of subjects with 63 themes. Some examples of these 63 themes are: "The Portable Memory" (Das tragbare Gedächtnis), "Communicating Houses" (Kommunizierende Häuser), "Molecular Farming – Plant as Factory" (Die Pflanze als Fabrik), "Teleoffice in the Rucksack – Mobility without Locomotion" (Das Telebüro im Rucksack: Mobilität ohne Fortbewegung) (Dietz 2002, p. 17 f.).

In the third phase of "Futur", a conference with about 300 participants from the inner circle took place, focusing on 25 themes (topic packages). The conference was also the starting point for building focus groups to elaborate the themes further. The focus groups consisted of 5 to 30 persons. Special attention was given to interdisciplinary composition. Later, the 25 themes competed with one another (Dietz 2002, p. 13). The 25 clusters of themes from this stage were oriented towards the main sectors of societal demand. Examples are: "Promotion of Intercultural Biodiversity" (Die Förderung interkultureller Biodiversität) or "Anticipatory Planning and Design of Liveable Work in the Knowledge Society" (Vorausschauende Planung und Gestaltung lebenswerter Arbeit in der Wissensgesellschaft) (Dietz 2002, p. 18, see also http://www.futur.de/en/321.htm, received 09.01.2003).

Of the 25 themes and the former 63 themes from the second stage, 13 were selected for further processing (focus topics) in Autumn 2001. There were two main inputs for this selection process: on the one hand, a survey within the research administration of the ministry and its project management agencies (Projektträger), on the other hand the Online-Voting of "Futur" participants including the outer circle (Dietz 2002, p. 13 f.). The following 12 focus topics are listed on the "Futur" website (http://www.futur.de/en/674.htm, received on 09.01.2003):

1. Farsighted Planning and Organisation of Satisfactory Work in the Knowledge Society
2. Germany as a Place of Learning – the Learning Society as a Factor of the Future
3. Living in a Networked World: Individual and Secure
4. Promotion of Intercultural Potentials
5. Dealing with Knowledge
6. Sustainable Mobility
7. Individual Medicine and Health Care 2020
8. Ways of Developing a Sustainable Nutrition Culture in a Changing Society
9. Sustainable Agricultural Production With Global Responsibility
10. Global Change – Regional Change: Recognising the Challenges and Opportunities of Global Change and Shaping Them Regionally
11. Decentralisation – A Strategy for Sustainable Ways of Life and Work?
12. Intelligent Products and Systems for Tomorrow's Society/ The Intelligent Product

In March 2002 the themes were again focused on six future scenarios. Again the research administration was surveyed and "Futur" participants were able to vote on the themes electronically. 300 "Futur" participants took this opportunity. It is worth mentioning that the results of the selection process by the research administration and the "Futur" participants in stages four and five were nearly the same. At this stage of Futur the Innovationsbeirat (innovation council) of the ministry was also involved in the decision process. The Innovationsbeirat is the high level advisory council of BMBF consisting of 12 persons from science, economy and NGOs (Dietz 2002, p. 15). The six favourites from this stage were (http://www.futur.de/en/5447.htm, received on 09.01.2003):

1. Individual medicine and health 2020
2. Access to the world of learning
3. Living in a networked world: personalised worlds of interaction
4. Efficient processes of knowledge
5. Intelligent processes
6. Understanding Thought Processes (added in June 2002 to the list of five)

4   IST in the German Foresight Exercise

4.1   General findings on IST

The German "Futur" project, which is the most recent project under the "foresight banner" in the country, is described as the "German Research Dialogue". Its starting point was a series of 9 workshops, which produced a collection of about 10,000 topics, that were classified by a list of 21 subject bundles comprising a total of 63 topics. The outcome were a series of "guiding visions" designed to provide input for the design of R&D support programmes by the ministry. Until summer 2002, four of the six themes from stage five were developed into guiding visions (also called "lead visions", in German "Leitvisionen"). The four guiding visions are (http://www.futur.de/en/5296.htm):

1. Understanding Thought Processes
2. Creating Open Access to Tomorrow's World of Learning
3. Healthy and vital throughout Life by Prevention
4. Living in a Networked World: Individual and Secure

These all contain aspects related to IST, with two visions strongly IST-oriented, but none of these are in a classical sense IST themes. This is a result of the demand driven approach of the formulation of research themes. Most of all, the vision of "Networks" involves more or less classical IST themes and the vision "Understanding Thought Processes" is on the innovative side of IST research.

The vision on *"Understanding Thought Processes"* is oriented strongly towards learning, with a stress on research rather than such things as "learning services" or IST applications in learning. Among the technologies mentioned in the context were artificial intelligence, new computer architectures and algorithms, autonomous robots, artificial retina, inner ears and muscle control, and organic computing.

The vision *"Creating Open Access to Tomorrow's World of Learning"* is even less technologically oriented than the first, although there is a section on "e-learning" which does not have high priority in the overall vision. The question raised in this context is about suitable strategies for the application and evaluation of e-learning. There is a scenario for the year 2010

which makes little or only vague mention of technology (virtual laboratories, distance learning, education management tools, networks). Skills are an important factor in this vision as is prevention of social exclusion.

The *"health" vision* is driven mainly by the concern of "social cohesion" and access to preventive medicine for all. The only technologies specifically mentioned are patient chip cards and mini laboratories for home use. Obviously data protection and security are mentioned in this vision, but they do not play any major role.

The fourth *vision "living in a networked world"* does address certain key technologies and cross-cutting issues related to IST, such as man-machine interfaces and ambient intelligence, described here as "ubiquitous and invisible infrastructure". Mobile communication, broadband, electronic services, embedded systems and nanotechnology are also mentioned. A major vision for IST is that these should be personal, individual and adaptable. Confidence, trust and vulnerability are major cross-cutting concerns as is social cohesion which is treated in the shape of preventing the digital divide.

The man-machine interface is described at greater length with such aspects highlighted as intuitive support by the communications interface, artificial intelligence, cognitive science, microsystems, voice control, visualisation and displays including electronic or intelligent paper, sensors and the semantic web.

In connection with mobile communication, a need to address the issue of energy supply is pointed out. "Socionics" are mentioned as a new direction of research in the area of autonomous software agents, including robot systems. Another area of research covered by this vision is labelled "networks and the structure of services", which makes vague reference to ubiquitous and mobile terminal devices, personal networks, greater bandwidth and innovative services.

Technologies mentioned in connection with security include quantum crypotography and DNA crypotography based on molecular biology.

4.2 Analysis of National Strengths and Weaknesses

There was no SWOT analysis in the "Futur" project, but there was mention of the danger of a brain drain from Germany to other countries in certain specialist fields.

4.3 IST Visions

The "Futur" dialogue gives special attention to issues which are not the subject of a single scientific discipline, and thus extend beyond the reach of existing programmes for the support of disciplinary research. The results of this process, which runs through several well-defined stages are themselves clothed in individual "lead visions" or "Leitvisionen". The goal of the lead vision 'Living in the Networked World: Individual and Secure' is to resolve the conflict between man and machine. Electronic networks and their services must be adapted to the individual needs of the user and be permanently available everywhere as a reliable infrastructure.

A new, comprehensive approach uniting various experimental approaches, computer simulations and mathematical models is the research field of computational neuroscience, with which the lead vision "Understanding thought processes" is mainly concerned. Better knowledge of how the brain manages information processing, cognition and creativity would open up com-

pletely new approaches and chances for research and society. One example are more efficient teaching and learning strategies that could result from this knowledge. Another objective is to "learn from nature" to revolutionise technical information processing.

The lead vision "Creating Open Access to Tomorrow's World of Learning" envisages a society which is capable of learning and in which each individual is willing to continue learning throughout life. Each member of society has access to individual worlds of learning which are adapted to personal needs.

Finally, the "lead vision" "Healthy and Vital throughout Life by Prevention" is targeted towards ensuring health and vitality for an ageing population by means of health-conscious behaviour of each individual and through living conditions that promote health, at the same time increasing motivation for living preventively. The task for research and development is to create the conditions for efficient prevention in the future.

5   The four guiding visions of Futur until Summer 2002

Until summer 2002, four of the six themes from stage five were developed into guiding visions (also called "lead visions", in German "Leitvisionen"). This marks the end of "Futur" and the beginning of the implementation process. The ministry, with support from the Innovationsbeirat, will implement in an appropriate manner these outcomes from Futur in its further research planning. It is clear that the role of the research administration is getting higher and higher from stages four to six (Dietz 2002, p. 16).

The four guiding visions are (http://www.futur.de/en/5296.htm):

Living in the Networked World: Individual and Secure

Two aims were of primary importance: 1) The digital networks must be oriented at the needs of the user and preserve the autonomy and individuality of the users. "Networking is not an end in itself" ("Futur" 2002, p. 42). 2) The digital network has to be a reliable infrastructure, allow bi-directional flow of information and has to be ubiquitous and invisible.

The future research priorities for this lead vision are ("Futur" 2002, p. 50 ff.):

1. Human-Machine Interaction and Mobile devices,
2. Embedded Systems,
3. Software Agents,
4. Networks and the Structure of Service Supply,
5. Security.

The authors further discuss non-technical innovatory factors and the need for interdisciplinary research.

Understanding Thought Processes

This guiding vision seems to be the most ambitious in terms of establishing an innovative field of science. The catchwords are: computational neuroscience, bioanalogous information processing, neuroimplantations, future computer architecture based on asynchronous dynamics, error tolerance, associative data processing, organic computing, neuroprotheses like artificial retina, systematic biology (Systembiologie). It is pointed out that Germany has a good position

in these fields, but also that international competition is quite strong. Recently massive growth in support for research and educational programmes can be observed in countries like USA, Israel, Switzerland and Japan. To prevent qualified experts from Germany from emigrating to other countries, there is a need for a big effort to establish a regional concentration of high ranking interdisciplinary expertise in Germany. A real challenge is to make the transition from theory to experiments and to educate young scientists in an interdisciplinary manner in the field of the neurosciences.

Creating Open Access to Tomorrow's World of Learning

In this guiding vision the themes are predominantly oriented more or less towards classical themes of education research with an emphasis on changing and supplementing established structures and implementing new forms of learning. Future support for research should concentrate especially on the following points: evaluation strategies for ensuring innovation transfer, registration and certification of informal learning, motivational and criterial research, networking of learning locations, learning by teaching, E-learning.

Healthy and Vital throughout Life by Prevention

In this vision great importance was attached to an interdisciplinary approach and the demand for implementation and transformation of present research results. Thus three research priorities were recommended: systematic data gathering and evaluation, implementation, acceptance/ethics. The authors' opinion is that in the area of health technology support priorities already exist, but that a systematic and holistic approach has hitherto been neglected.

6   Literature

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Annex 1: Tabular Overview

Foresight effort "FUTUR" year 2001/2002 / Germany	
Categories, Criteria & Questions	**Answers**
Project promoter / initiator	– Federal Ministry of Education and Research (BMBF)
Agency or organization responsible for the foresight activity	– IFOK (Institute for Organisational Communication), Bensheim / Berlin and subcontractors: ISI (Fraunhofer Institute for Systems and Innovation Research), Karlsruhe; IZT (Institute for Future Studies and Technology Assessment), Berlin; VDI / VDE-IT (Technology Centre Information Technology), Berlin; Science & Media; Pixelpark AG, Köln
Scope / areas covered	– to formulate visions for programmes operated by the research ministry. No predefined boundaries of scope
Time horizon	– not exactly specified (about 2020)
Societal dimension	– strong orientation towards societal goals, for instance solving a pressing problem of society, connection of the needs of the society with technological and social innovation
European dimension	– not explicit, rare importance
Major explicit objectives	– influence priority setting of federal research programme – with a high degree of complexity and interdisciplinarity – oriented on societal demands – support comprehensibility
Second order objectives and indirect effects	– support and evaluate a participatory approach
Impact	– to further priority setting and development of research programmes by the Federal Ministry of Education and Research (BMBF)
Target groups	– Federal Ministry of Education and Research
Participation	– representative for all members of society, one third from science, industry and society, with special attention to SME, young scientist, women and artists.
Major Characteristics	– selective reduction of items until the formulation of 4 lead visions
Methodology	– open dialogue with experts and citizens – televoting over research priorities via Web – workshops – focus groups – future scenarios
In which way have IST been included and treated in the FS exercise?	– no special attention was given to IST. IST is integrated in the formulation of the overall research lead visions.
Strengths/opportunities weaknesses/threats identified in IST	– no special attention was given to this question
Dissemination	– special attention is given to understandable information for the public via a Newsletter, the Web, conferences and road shows