FAZIT – The Future of ICT in Baden-Württemberg

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Purpose

In FAZIT (research project for current and future-oriented information and media technology and its use in Baden-Württemberg), present and future demand and applications for innovative information, communication and media technologies are being explored. The objective is to identify key drivers for new markets and innovations in the ICT sector in Baden-Württemberg, Germany, which are important for further regional development. The different activities are intended to bring together actors in a regional innovation system, both from the ICT sector and traditional industries. A final roadmap for "new markets in the ICT sector in Baden-Württemberg" is intended to integrate the milestones, which can be strategically used by State decision-makers.

How Can Foresight Contribute to STI?

How can research on science, technology and innovation (STI) contribute in guiding practical policy? An ongoing foresight exercise in Baden-Württemberg, Germany, called FAZIT is one of the processes intending to answer this question.

What is FAZIT?

The theoretical framework of the non-profit research project is the regional systems of innovation approach. Innovations are an evolutionary and cumulative process with internal feedback loops, which can only be realised by relevant regional actors interacting economically and socially (Koschatzky, 2005). Results from this process are technological, organisational and social innovations. This underlines the significance of social aspects in the innovation process, especially through collective learning processes and integration of the different actors in the region.

Combination of Delphi Surveys, Scenarios and Roadmap

Fraunhofer ISI is conducting a multi-stage foresight process in order to identify relevant fields of research and future developments in the field of ICT and media technologies that are vital for the region of Baden-Württemberg. As technological, social and economic trends closely interact with each other, a combination of foresight methods is being applied. The foresight process consists of three **Delphi** studies, a scenario process and a roadmap for future ICT developments. Each phase of the foresight process is closely linked with ongoing ICT monitoring and the results of studies on market issues.

In a first step, Fraunhofer ISI is carrying out three Delphi studies. Each of the three Delphi surveys involves about 500 to 1,100 regional, national and international German-speaking

experts from business, science and society. The first Delphi study dealt with social aspects of ICT adoption and implications of the innovations. The second Delphi survey is about ICT & Health, and the last will deal with technological developments in other related fields.

The third Delphi survey was directly derived from the FAZIT **scenario** process. On the basis of a scenario workshop, topics were formulated and were assessed in a two-round Delphi survey. The Delphi results will be included in the final FAZIT scenario on science and technology. Thus, a two-fold integration of the results is intended.

The scenario process aims at generating a multi-dimensional picture of new markets arising through ICT in Baden-Württemberg. For the duration of the project content will be continuously supplemented. It is of vital importance to the scenario process in FAZIT that the following questions are addressed: How will the field of IT and media in Baden-Württemberg develop by the year 2020? Which issues and areas are of particular significance, which traditional indus-

tries will be particularly affected by developments in ICT, and how does the situation in Baden-Württemberg differ from those in other regions? It becomes necessary to link the results from the Delphi survey and from the market studies with the actual scenarios, as one step in the scenario process is the conception of alternative paths for future developments. In addition, successive (partial) scenarios might be generated.

At the end of the foresight activity, a **roadmap** extending to 2020 will be drawn up for the ICT industry in Baden-Württemberg. Road-mapping is a way of bridging the gap between today and the scenarios or images of the future. They are close to planning and define the first steps or even targets on the way to the imagined future (Cuhls/ Möhrle, 2004; Möhrle/ Isenmann, 2004). Vitally important to this is the identification of milestones and critical bottleneck factors which require urgent action and which raise questions for further research. The results of the previous foresight modules will be summarised and integrated into the roadmap.

User Acceptance as a Major Issue

The methodological challenge of the first Delphi survey consisted in integrating technical and social questions. Notably, the design of the topics, statements and "questions" (criteria to be judged upon) were adapted in a way that the results can be integrated into and used during the scenario creation process. They were not directly derived from the scenario process but developed separately.

The survey was conducted online and in two rounds including feedback. What was new was that the questions covered social and demand-side aspects with regard to general trends, such as the demographic development in Baden-Württemberg, rather then being based on technological or research assumptions. As a result, user acceptance of the different technologies was often discussed as a major issue. The most feasible topics were the following:

- Due to widespread virtual co-operation within enterprises and corresponding organizational forms, people can work more efficiently, innovatively and creatively in many areas (e.g., R&D, marketing).

- Very good IT skills are necessary for more and even simple jobs. This means that workers without IT skills will be forced out of the job market.

- Biometrical access controls to public buildings and workplaces are generally accepted.

- Besides preventing and combating crime, permanent surveillance of public places also serves to pursue the infringement of regulations.

- In social sciences and humanities more than half students also make use of virtual reality simulations at least once a semester.

- More than half of drivers accept that their vehicles pass on anonymized information about themselves as well as local traffic and street conditions to other vehicles in order to receive such information in return.

The **second Delphi survey** was intended to be a technical Delphi, i.e., dealing with technical questions of high relevance for Baden-Württemberg. ICT developments can contribute to meeting Baden-Württemberg's challenges of demographic change as well as changes in the health care system. Literature research was the starting point. Then a structure of applications on the one hand and technologies on the other (visualized in a mind map) was developed as input for an expert workshop. Here, technical and other experts (e.g., from a health insurance provider, an association and physicists) discussed the needs of the health system and formulated first Delphi topics.

An online Delphi questionnaire was developed and sent to more than 1,000 experts from academia, industry, doctors and their associations as well as research organisations. In the second round, feedback was given (aggregated answers from the first round) so that the experts could assess the topics. The results of the second round were the end results for further use in the following scenario processes.

One first result here was that it is not a specific technology, but rather the question of the **system itself** which is crucial in preparing for the future. Furthermore, developments in specific areas were rated according to three criteria: as extremely important for the quality of life, as desirable, as developments that will definitely be realised in the short- to medium-term.

New Markets for ICT

New markets for IT-based health services are expected in the fields of **language recognition, virtual reality, simulations, databases, sensors, radio frequency identification** (RFID)

and **new management and planning systems**. It makes a significant difference if the technology as such is only applicable in the **health sector** or can be used in other sectors as well. The health sector is a large market, but often not large enough for such a new development and its market penetration. In detail, a market seems to be realistic in the following areas:

- **sensors** for measuring long-term **blood pressure**;

- **RFID in houses** for people who are forgetful and need to find their way back or find things via RFID tags;

- **expert systems and databases** which test **drug combinations** for undesirable side-effects and which propose alternative therapies without these potentially harmful interactions and side effects;

- **patients in hospitals** being controled by ICT systems to avoid extended waiting times for admission, for surgery, X-ray examinations, etc, allowing hospitals to work more efficiently;

- an ICT system for **mobile doctors** so that they can access all their patients' data;

- **regional microwave hyperthermia** can be optimally planned by computer simulation of **body heat distribution**;

- **virtual reality** becoming standard practice in the **education** of medical specialists (virtual surgeries, minimal-invasive interventions, endoscopic examinations, patient dialogues);

- **documentation** in a hospital handled entirely by **speech recognition**.

The topics concerning **robots in healthcare and in surgery** are more critically assessed, e.g., "In many hospitals, robots are used for heavy and standardised jobs in care, in order to give personnel more time for the personal care of patients". The experts think that they are feasible and will be realised – however, they do not want them (high rate of "unwanted").

ICT Impacting Traditional Industries

In addition to the foresight exercises, market studies are being conducted to investigate the impact of ICT developments on traditional industries in the region:

- market potential for IT-supported health services;

- potential for flexibilisation via e-businesses;

- market potential for social software;

- ecological efficiency increase via IT;

- IT and intralogistics;

- visualization and simulation in product development.

The market studies review the potential for the use of ICT for different regions or technology clusters in Baden-Württemberg

and identify capabilities on a regional level. They are therefore suitable for policy-makers on different levels, from the local and regional to the federal level. They indicate possible directions of future innovations and markets and complement the data on the future of Baden-Württemberg.

Scenario Planning

Different scenarios for Baden-Württemberg are being drawn up. The first one is a "baseline scenario". In this scenario, the structural data of the German Federal State and trends for the future are described. A storyline based on this data illustrates the scenario.

Additionally, more detailed "in-depth" scenarios in different IT-related fields are being outlined. One of these will be a technology scenario. For this, the data generated by the second Delphi survey will be used and included in the description and the story. The statements made in the survey as well as the estimated time of realisation will be the major sources of input to base the scenario on. The scenarios will be completed in autumn 2007.

Dissemination Directly to Society

The results of the ongoing activities are available as reports. A symposium on ICT use by older people was held as a follow-up to the first Delphi survey and the market study on IT-supported health services. Meanwhile, more than 30 presentations of the project have been held at international and national conferences and seminars. 25 papers have been published.

Other implementation activities are:

- the support of regional innovation systems via company software through the transfer of relevant results for the clusters;

- implementation of relevant special trends in existing clusters and networks (Kreatek – another MFG Foundation project);

- further development of trends in social software and social media (visual computing);

- transfer in trend studies and impacts for medium-sized companies (Web 2.0);

- direct transfer of future trends from the studies to research institutions for software development and IT trends (ebigo.de);

- transfer of trend studies and their implications for relevant web sites (Software Research Day);

- adaptation of technology transfer to relevant future areas (doit-online/mfg-innovation – other MFG Foundation projects).

Decision-makers from companies and organizations can make use of the information for their own purposes. FAZIT serves mainly as information input for them and for anybody else wanting to know about the future of IT in Baden-Württemberg – an ultimately all over the world as this is an international topic.

Super-regional Implications

FAZIT is a regional initiative but deals with international topics in the ICT sector. Therefore, the results generated by the future-oriented part of the project are not only relevant for the Baden-Württemberg audience, but also for international players in the game.

Sources and References

Available results (primarily in German).

- Von Oertzen, Jürgen, Cuhls, Kerstin, Kimpeler, Simone: Wie nutzen wir Informations- und Kommunikationstechnologien im Jahr 2020? Ergebnisse einer Delphi-Befragung, FAZIT-Schriftenreihe, Band 3, Stuttgart 2006, www.fazit-forschung.de

- Cuhls, Kerstin; von Oertzen, Jürgen und Kimpeler, Simone: Informationstechnologie und Gesundheit. Ergebnisse einer Delphi-Befragung, FAZIT-Schriftenreihe, Stuttgart 2007, www.fazit-forschung.de

- Cuhls, Kerstin und Möhrle, Martin G.: Unternehmensstrategische Auswertung der Delphi-Berichte. in: Möhrle, Martin G. and Isenmann, Ralf (eds.): Technologie-Roadmapping, Zukunftsstrategien für Technologieunternehmen, 2nd edition, Springer, Berlin 2004, S. 103-130

- Martin G. and Isenmann, Ralf (eds.): Technologie-Roadmapping, Zukunftsstrategien für Technologieunternehmen, 2nd edition, Springer, Berlin 2004

- Koschatzky, Knut: Foresight as a Governance Concept at the Interface between Global Challenges and Regional Innovation Potentials. In: European Planning Studies 13 (2005), 4, S. 619-639

- Kimpeler, Simone; Döbler, Thomas: The Future of IT and Media Technologies and their Use in Baden-Württemberg: Fazit - A Multi-Method Approach of Monitoring and Foresight. In: Companó, Ramón (Ed.) u.a.: IST at the Service of a Changing Europe by 2020: Learning from World Views: FISTERA Final Conference, Bucharest: Publishing House of the Romanian Academy, 2005, S. 122-131

Publications available at: www.fazit-forschung.de