The Fraunhofer Institute for Systems and Innovation Research

- studies on how innovations originate, who benefits from them and how they can be promoted
- evaluates economic, social and political potentials and the limits of technical innovations
- helps decision-makers in industry, science and politics in taking strategic decisions / setting a strategic course

interdisciplinary research at the interface of Society, Technology and Industry
Contents

- FAZIT- Project:
  - foresight-process
- Results from the Delphi survey:
  - method and survey design
  - presentation of results
- Conclusions
- **Research project** for present and future oriented ICT and their applications in Baden-Wuerttemberg (State Ministry of BW, 2005-2008)

- **Aim**: identification of key drivers for new markets

- **Foresight process**: Delphi, Scenario, Roadmap

**FAZIT**: Research Project for current and forward-looking Information and Media Technology and its Use in Baden-Wuerttemberg (www.fazit-forschung.de)
The Aim of Delphi Surveys

- **Delphi surveys** are expert surveys in more than one round.
- A **topic** related questionnaire is initially handed out.
- In the second round, a **feedback** of the answers is given.
- **Everybody** can judge **once more**, anonymously, influenced by the initial overall results.
- Delphi Surveys deliver data about **opinions**: they are **not facts**.
- They give a hint, what others think; if there is an **agreement** on the topics or if **opinions differ** a lot.
- They are an **assessment of future** developments in different fields.
- They do **not provide** direct **priorities**.

**Source**: Cuhls 2006
Delphi on ICT and Health: Surveys Focus and Design

- **Focus**: Future Information Technology (IT) for the Healthcare Sector

- **Electronic survey**: 2 rounds May - July 2006

- **Sample**: 203 experts from research institutions, industry and associations

- **36 theses, topics and statements** were selected by literature analysis, expert interviews and a workshop

- **Criteria**: probability of realisation; desirability of topics, impact of realisation, obstacles for realisation

- **Time horizon**: 2010 until 2030 or later

Structure of the sample after the second round

N = 203
### Topics with Early Realisation

<table>
<thead>
<tr>
<th>Theses</th>
<th>Year of Realisation (50%-Point)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Expert systems and databases, which monitor customised medications for individual patients with respect to undesired medication interactions and recommendations for a pharmaceutical therapy with reduced adverse reactions and side effects, are tested in pilot experiments.&quot;</td>
<td>2010</td>
</tr>
<tr>
<td>&quot;Patients in hospitals are directed by an EDP-supported planning system, so that waiting periods, e.g. at admission, diagnostic procedures (X-ray, CT, endoscopy, etc.), operation are minimised and at the same time the overall efficiency of hospital facilities is enhanced.&quot;</td>
<td>2010</td>
</tr>
</tbody>
</table>
## Topics with late Realisation

<table>
<thead>
<tr>
<th>Theses</th>
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</tr>
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<tbody>
<tr>
<td>&quot;Entire artificial kidneys have been developed.&quot;</td>
<td>2022</td>
</tr>
<tr>
<td>&quot;An artificial heart and lung implant receives marketing approval.&quot;</td>
<td>later</td>
</tr>
</tbody>
</table>
**Desirability of Topics (Very High)**

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<tr>
<td>&quot;<strong>Entire artificial kidneys</strong> have been <strong>developed.</strong>&quot;</td>
<td>2022</td>
</tr>
<tr>
<td>&quot;<strong>Virtual reality</strong> is a <strong>standard in training for medical staff</strong> (e.g. virtual surgery, practising of minimally invasive interventions, endoscopy, rescue practices, patient interviews etc.).&quot;</td>
<td>2012</td>
</tr>
<tr>
<td>&quot;<strong>Blind persons</strong> can orient themselves within a room with a <strong>retina implant.</strong>&quot;</td>
<td>2018</td>
</tr>
<tr>
<td>Theses</td>
<td>Year of Realisation (50%-Point)</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>&quot;An implantable data carrier has been developed, storing all data of</td>
<td>2013</td>
</tr>
<tr>
<td>a patient necessary for treatment and administration.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;Many hospitals employ robots for difficult and standard procedures</td>
<td>2018</td>
</tr>
<tr>
<td>in nursing (e.g. putting someone into another bed, changing of bedclothes) in order to relieve the nursing staff and enable them to have more time for personal attentiveness towards the patients.&quot;</td>
<td></td>
</tr>
</tbody>
</table>
Importance of various Topics and Obstacles for Implementation

- saving costs
- better prevention
- better quality
- technical improvements
- higher quality of life
- environmental protection/sustainability

- technical problems
- R&D infrastructure
- financing research
- costs
- influence of interest groups
- education

- acceptance by those affected
- acceptance by users
- data security/protection
- standards and norms
- regulation
- others and no answer
### Theses

<table>
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<td>&quot;An implantable data carrier has been developed, storing all data of</td>
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<tr>
<td>a patient necessary for treatment and administration.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;In emergency cases, in order to be able to identify a person very</td>
<td>2016</td>
</tr>
<tr>
<td>soon after an accident, a quick genetic test is completed and the</td>
<td></td>
</tr>
<tr>
<td>data is matched with a profile database.&quot;</td>
<td></td>
</tr>
</tbody>
</table>
Highly Scored Topics for Better Quality of Healthcare Sector and High Data Security/Protection-Problems

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<tr>
<td>&quot;An <strong>implantable data carrier</strong> has been <strong>developed</strong>, storing all data of a patient necessary for treatment and administration.&quot;</td>
<td>2013</td>
</tr>
<tr>
<td>&quot;A <strong>computerised system</strong> exists, which allows practice-based physicians to access all <strong>information at hand about the patient</strong> (cryptographically secured) via a terminal of their choice during house calls.&quot;</td>
<td>2012</td>
</tr>
</tbody>
</table>
Conclusions I

- **ICT in the Health Sector** continues to be an **important topic** in the coming years;

- In the overview all theses – near **future realisations** as well as later ones – are expected to evolve around the year 2020;

- Although **technical obstacles** are a major hindrance, **other obstacles** play a **significant role** as well (e.g. the acceptance by parties involved and users, costs);
Many of the technical solutions which can lead to new markets, consist of low-profile unspectacular developments, which employ the use of a technology that, already today, is in use (e.g. telemonitoring of risk patients);

Although there have been tests and first applications, monitoring on a closely meshed base in the sharpened phrasing of the Delphi study as a “standard” are not yet reality.

Theses that involve implantations (e.g. electrodes in the brain in order to prevent epileptic seizures) as well as transdermal interventions (e.g. biopsy robots) are considered desirable.

However, their desirability does not extend to the stage of other theses. Besides ordinary technical problems, data integrity and data protection or acceptance by the persons concerned are often stated as obstacles.
Conclusions III

- **ICT-based applications** such as telemonitoring, expert systems and databases or external data access receive the highest rating with respect to their importance in cost cutting, improving the healthcare system or the quality of healthcare.

- **New markets** for ICT in healthcare applications are expected in the areas of voice recognition, virtual reality and simulation, databases, sensors, Radio Frequency Identification (RFID) and new management and planning systems.
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Thank you for your attention!
Structure of Topics/Statements
Overall Importance of Topics

- saving costs
- better prevention
- better quality
- technical improvements
- higher quality of life
- environmental protection/sustainability
- others
Constraints of Implementation
This paper was produced for a meeting organized by Health & Consumer Protection DG and represents the views of its author on the subject. These views have not been adopted or in any way approved by the Commission and should not be relied upon as a statement of the Commission's or Health & Consumer Protection DG's views. The European Commission does not guarantee the accuracy of the data included in this paper, nor does it accept responsibility for any use made thereof.