Using Technology Roadmapping for the Development of a Sustainable Information Society

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Agenda

- **Fraunhofer Institute for Systems and Innovation Research (ISI), Karlsruhe (Germany)**
- **Introduction to Technology Roadmapping**
- **ICT-ENSURE for Environmental Sustainability Research**

The Fraunhofer Institute for Systems and Innovation Research (ISI) …

… is one of the leading institutions for scientific and applied research

- investigates **innovations, innovation systems and innovation management** (technologies, products, services, actors, drivers etc.)
- evaluates **potentials, impacts** and **limits** of **technical innovations** in terms of economic, environmental, social and political consequences
- supports decision-makers in industry, science and politics in **foresight and strategies**
- handles about **250 research projects** per year

The Fraunhofer ISI covers 7 interrelated Competence Centers …

Policy and Regions
Business Areas:
- Policy and Evaluation
- Regions and Clusters
- Innovation Indicators

Regulation and Innovation
Business Areas:
- Regulation
- Standardization

Sustainability and Infrastructure Systems
Business Areas:
- Water Management
- Transportation Systems
- Systemic Risks
- Sustainability Innovations and Policy

Energy Policy and Energy Systems
Business Areas:
- Energy and Climate Policy
- Energy Efficiency
- Renewable Energies
- Energy Economy

Industrial and Service Innovations
Business Areas:
- Process Innovations
- Industrial Services
- Networks and Location Management

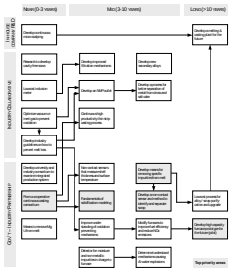
Innovation and Technology Management and Foresight
Business Areas:
- Foresight and Futures Research
- Management of Innovations and Technologies
- Strategies for Material Technologies

Emerging Technologies
Business Areas:
- Biotechnology and Life Sciences
- Innovations in the Health System
- Information and Communications Technologies
- Economics of Emerging Technologies

Introduction to Technology Roadmapping

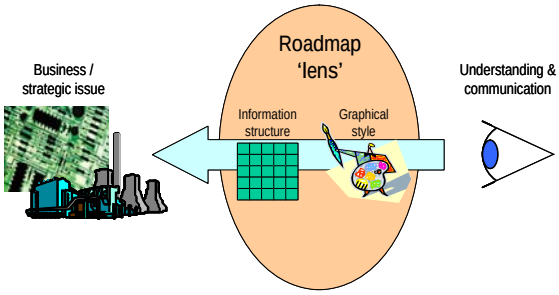
Technology Roadmapping – ICT-ENSURE –Conclusions

There is a straightforward analogy …



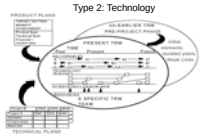
Source: The Aluminium Association (1997)

Roadmapping provides a method for foresight. It could be used as a lense …



Roadmaps have been created for different purposes …

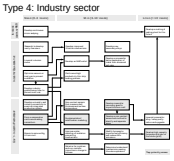
Type 2: Technology



Type 3: Organization

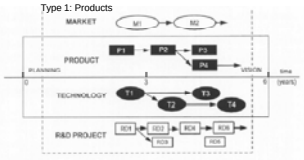
Quelle: http://www.roadmap-it.de

Type 4: Industry sector



Quelle: The Aluminium Association (1997)

Type 1: Products

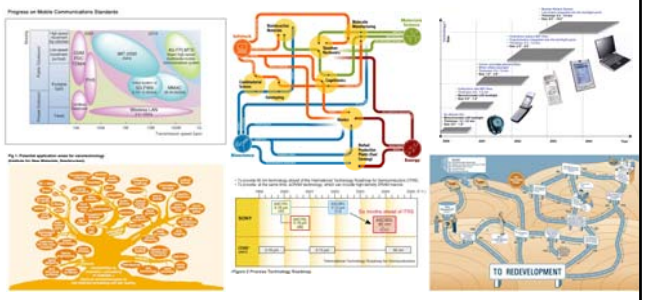


Quelle: Groenveld (1997)

Type 5: Knowledge

Quelle: http://www.tcwk.de/home.html (2005)

… and roadmaps can take various forms …

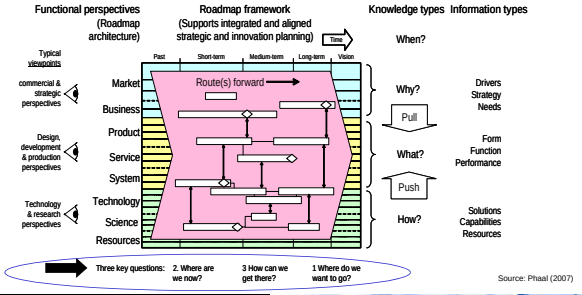


… its use has even reached the political agenda …

Example: Roadmap for Peace in the Middle East

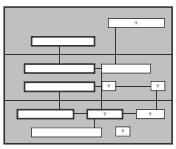
(Source: http://www.state.gov/r/pa/ei/rls/22520.htm)

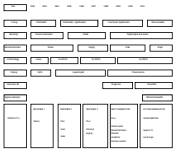
Roadmaps combine multiple perspectives and suggests a structured procedure …



Source: Phaal (2007)

Roadmapping: moving from a divergent process to a convergent process

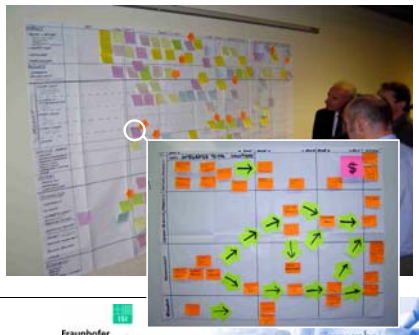




Divergent process → Convergent process

Explore → Shape → Plan → Implement

Roadmapping is often processed and carried out in workshop acitivities



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ICT-ENSURE: Roadmap for Environmental Sustainability

Technology Roadmapping – **ICT-ENSURE**

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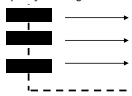
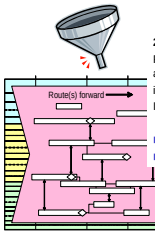
ICT-ENSURE: Fuelling the Roadmapping in areas relevant for ICT-ENSURE

WPs WPs ... ICT-ensure ... WPs WPs

1 Identification of actors:
Networks, communities, experts in selected areas of relevance for ICT-ENSURE

- Goal: Enlargement of the Environmental Informatics Community
- Effort: Capacity building





2 Analysis of actions:
Research programmes, projects, actions in selected areas of relevance for ICT-ENSURE

- Goal: Structured research map
- e.g. web-based database, RPIS

Single Information Space Europe

European Research Area for ICT-ENSURE

Time

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Thank you for your attention!

... time for discussion and further questions ...

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Any comments and feedback are most welcome!

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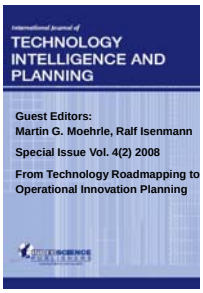
Further reading ... (i) to Technology Roadmapping ...



... (ii) to a Sustainable Information Society ...

... (iii) to the role of ICT for Environmental Sustainability Research

The relationship: information society-sustainability does not seem to be clear: Puzzle picture?



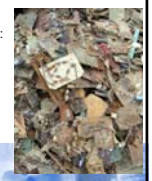


Information society: Opportunities for sustainability a n d (!) danger to accelerate unsustainability.

Opportunities for sustainability:
ICT can provide unique opportunities for environmental sustainability:

- helping to dematerialise economic processes
- reduce material and energy throughput.

However: ICT do **not automatically** contribute to environmental sustainability, though: Rapid progress and ubiquitous use create new problems for individuals, society and nature, e.g.:



- Electronic waste,
- high consumption of resources for PC manufacturing
- energy consumption for running the internet.

Key findings (i)

Status quo: ICT do bring about new **opportunities** and new **problems**:

- Fears need to be taken seriously and accepted as indicators for risks, without giving in to pessimism and panic.
- Opportunities that ICT offer merit exploitation.

Need for reserch and action: We need to assess and manage opportunities a n d risks of ICT,
⇨ but how?
⇨ on what basis?
(discourse, multi-stakeholder forums, experts vs. public participation?)

Key findings (ii)

Proposal: Developments towards a sustainable information society have to be based on three fundamental categories of criteria:

- **Human** compatibility: individuals
- **Social** compatibility: communities
- **Ecological** compatibility: nature

Further, three different levels of impacts need to be taken into account:

- Effects of **ICT provision**
- Effects of **ICT use**
- **Systemic effects**

Key findings (iii)

ICT will play a key role in the development towards a sustainable information society.

Only if both discourses, on information society and suatianability are systematically combined, a „window of opportunity" will be opened to approach a long-term liveable future.

The challenge consists of winning the hearts and minds of ICT experts and decision makers for sustainability.

Conceptual approach: Two-dimensional grid covering: (i) fundamental criteria for sustainability (columns) and (ii) different levels of ICT impacts (rows).

Level of ICT impacts ... \ ... regarding to ...	Human compatibility	Social compatibility	Ecological compatibility
Effects of ICT provision	X	X	X
Effects of ICT use	X	X	X
Systemic effects	X	X	X

The columns cover three fundamental criteria for sustainability ...

Fundamental criteria for sustainability (dimension 1):

- **Human** compatibility:
  Individuals should not suffer damages from development. Their personal dignity must be respected.
- **Social** compatibility:
  Relationships of people with one another and the resulting society should not be infringed. Individual participation in our communities needs to be protected and supported.
- **Ecological** compatibility:
  The natural environment must not be irreversibly damaged, and our life support systems must be protected.

The rows classify three different levels of ICT impacts ...

Classification of ICT impacts (dimension 2):

- **Effects of ICT provision**
  e.g., use of resources and energy in the manufacturing, use, and disposal of ICT hardware.
- **Effects of ICT use**
  e.g., energy savings from process optimisation or commuter traffic reduction as a result of telecommunication.
- **Systemic effects**
  e.g., rebound effects as a reaction to efficiency gains, changes of economic structures, institutions, and consequences for individual lifestyles.