



Emerging Technologies

– new skill needs in the field of nanotechnology

Prof. Dr.-Ing. Dieter Spath

Fraunhofer Institute for Industrial Engineering (Fraunhofer IAO),
www.iao.fraunhofer.de

Profile of the Fraunhofer Society



- ❑ Founded in: 1949
- ❑ Staff of 12 000 (2002)
- ❑ Research volume of 1 billion Euro (2002)
- ❑ 58 research establishments, operating as independent »Profit Centers« in Germany as well as research establishments in USA and Asia



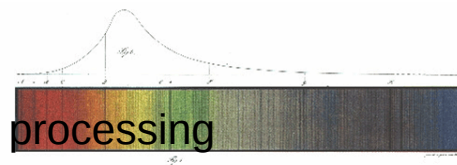
Patron Joseph von Fraunhofer

Researcher

discovery of “Fraunhofer Lines” in the sun spectrum

Inventor

new methods of lens processing



Entrepreneur

head of royal glass factory



Fraunhofer

Institut
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Future market perspectives:

Today's research with FRAUNHOFER for tomorrow's future

1. Internet of Things
Autonomous packages!
2. Intelligent Products and Environments
Ever-ready, invisible helpers!
3. Microenergy Technology
Power for the journey
4. Adaptronics
Materials become active
5. Simulated Reality for Products and Processes
The future in the computer
6. Human-Machine Interaction
No need to press buttons ever again



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Future market perspectives:

Today's research with FRAUNHOFER for tomorrow's future

7. Grid Computing for Companies
Computing power on tap
8. Integrated Lightweight Systems
Slimming diet for cars & co.
9. Industrial (white) Biotechnology
Nature as a chemical factory
10. Tailored Light
Light as a tool
11. Polytronics
Printed electronics – luminous wallpaper
12. Safety technologies to avert danger
Saving lives through safety

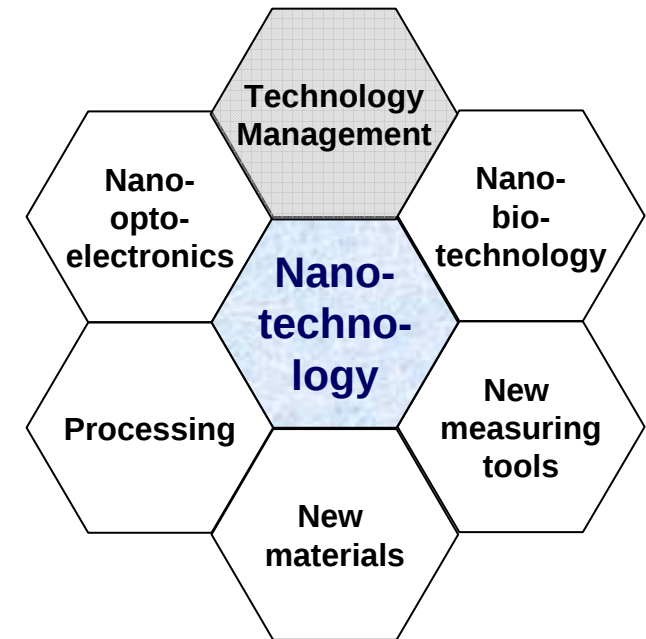
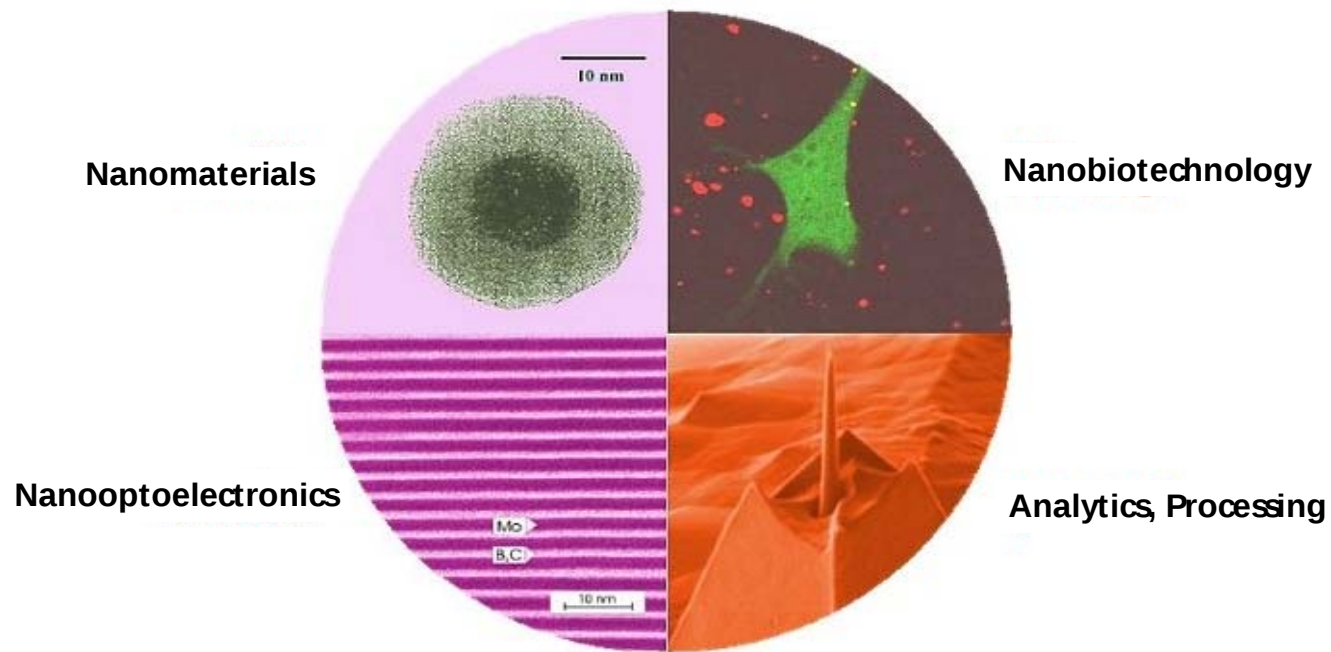


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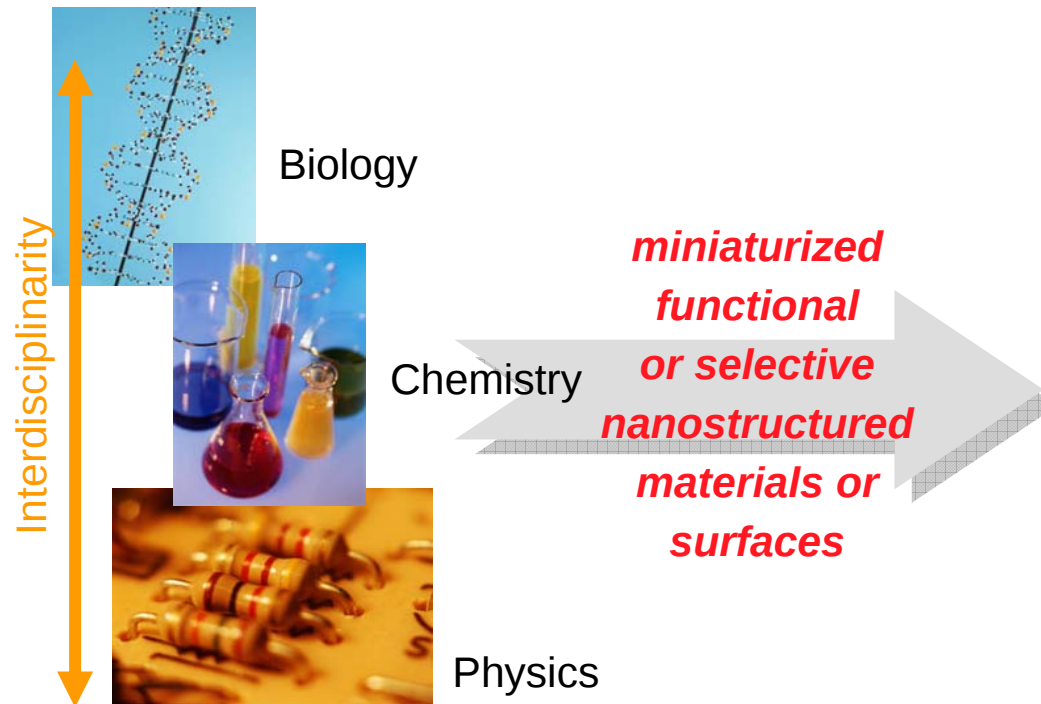
Fraunhofer Nanotechnology Alliance:

www.nano.fraunhofer.de



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Innovation by Nanotechnology



Applications e.g. in ...

Functionalizing and Refining of Surfaces

E.g. surfaces with self-cleaning or optical functionalities

Catalyses, Chemistry and material synthesis

Catalytic nanoparticles, reactive membranes, porous filter material and adsorbents, molecular moulding

Energy conversion and usage

Nano materials in photovoltaics and fuel cells, hydrogen storage, effective batteries

Construction

Nanosensors and Actuators

„Thermo labels“, Lab-on-a-Chip-Systems

Information processing and transportation

Electronical, optical and opto-electronical components, organic LEDs

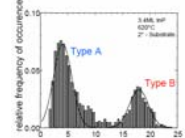
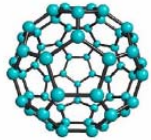
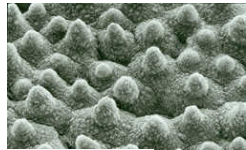
Life Sciences

Analytics/ diagnostics, transportation of medical agents, packaging, cosmetics



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Example: Innovation in Environmental Technology through Nanotechnology



New Applications and Technologies

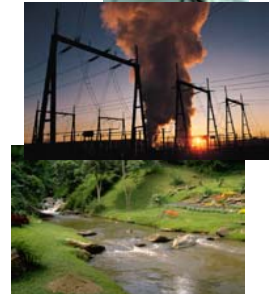
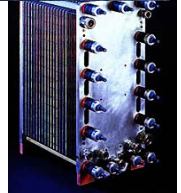
New applications of nanotechnology with so far unknown functionalities and applications
Example: Copying/ Reproducing photosynthesis

Substitution

Nanotechnology replaces existing technologies and creates a new state of the art
Example: Nanostructured surfaces for absorption or catalytic filters or membranes

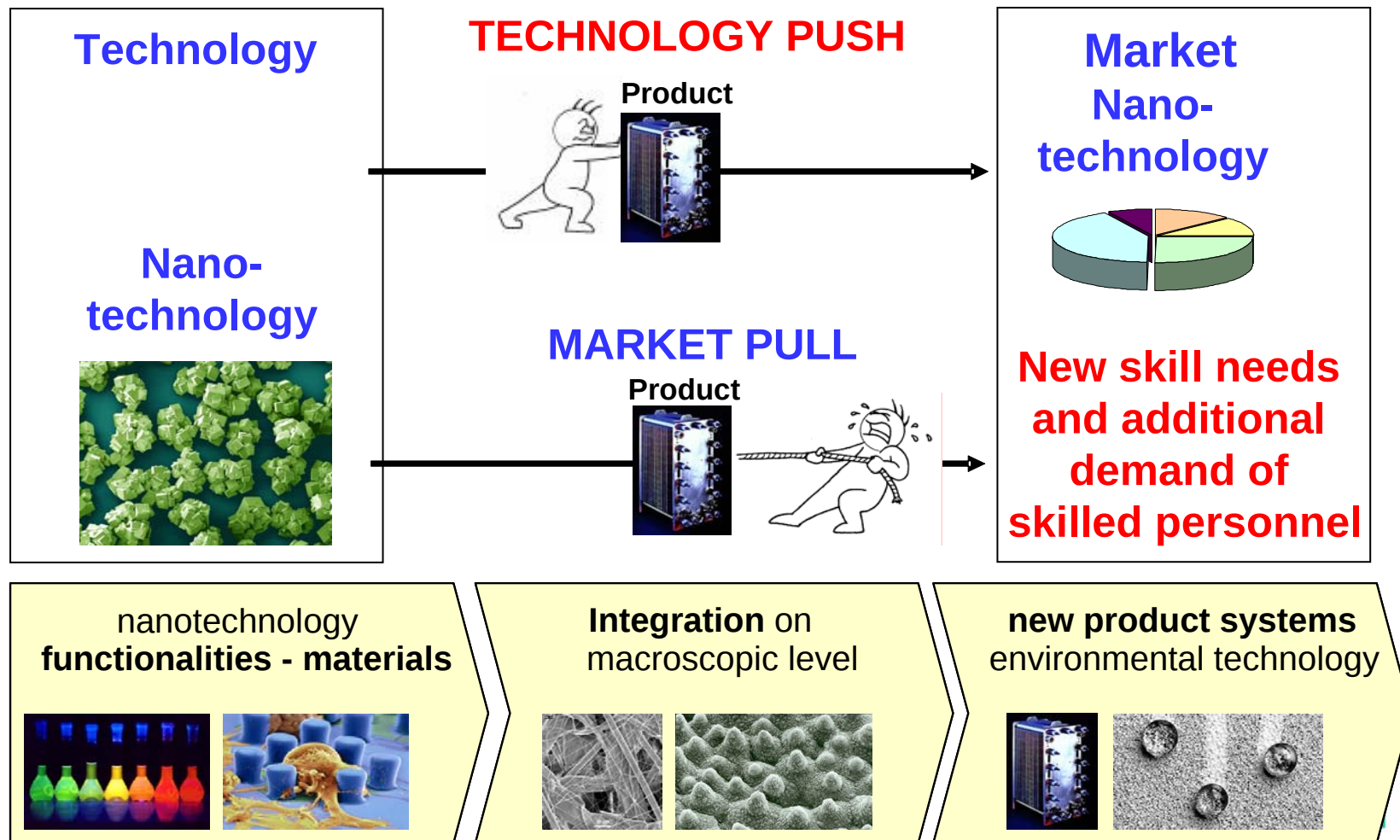
Complementary Technology

Nanotechnology facilitates processes in environmental technology or industrial engineering
Example: Small and efficient battery systems allow self-sufficient environmental monitoring with miniaturized sensors

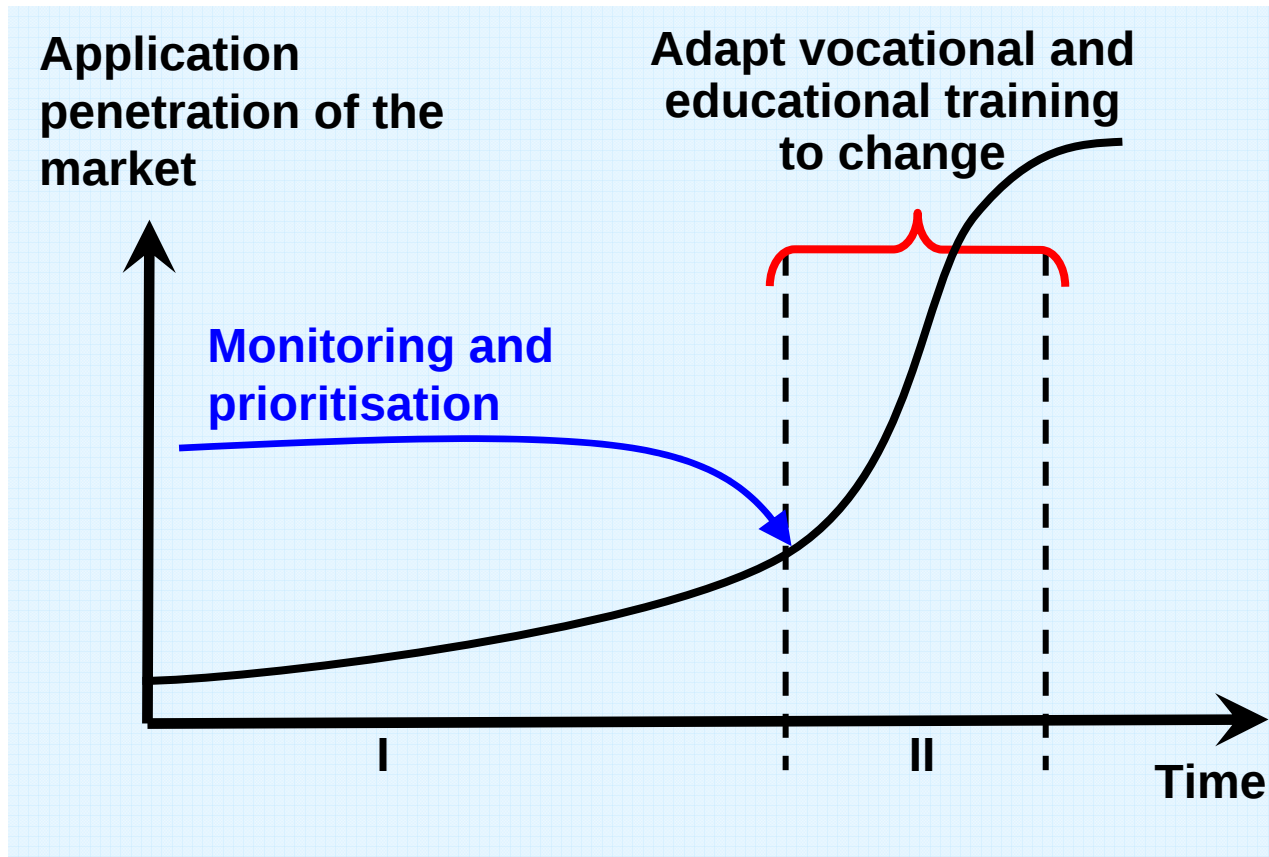


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Functionalities of Nanotechnology and the Market



Timely response of the further training system by early identification of skill needs



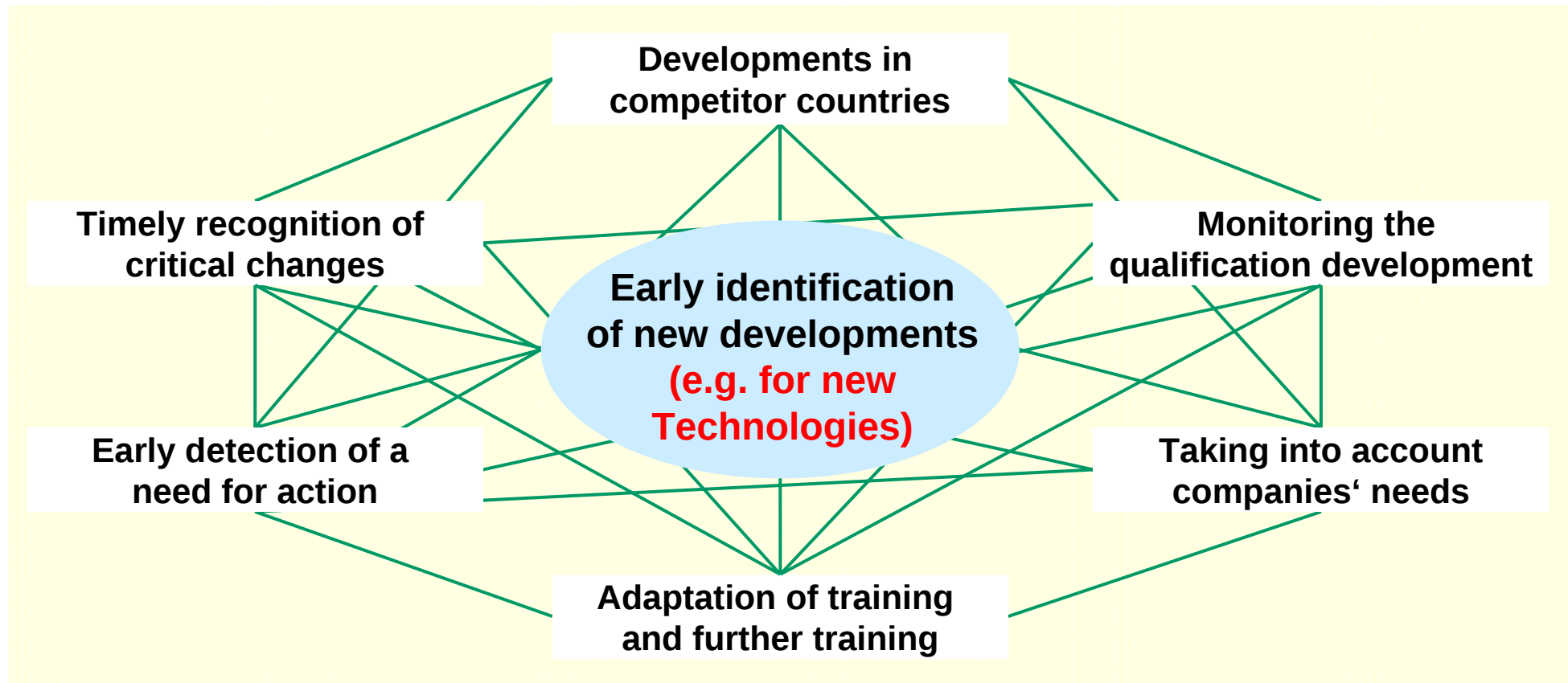
- I. **Monitor trends with a high degree of change**
e.g. R&D activities, technological innovations
- II. **Quick response to increasing qualification demands**
e.g. develop new further training offers

Technology monitoring is needed as a standard process in order to avoid skill shortages.



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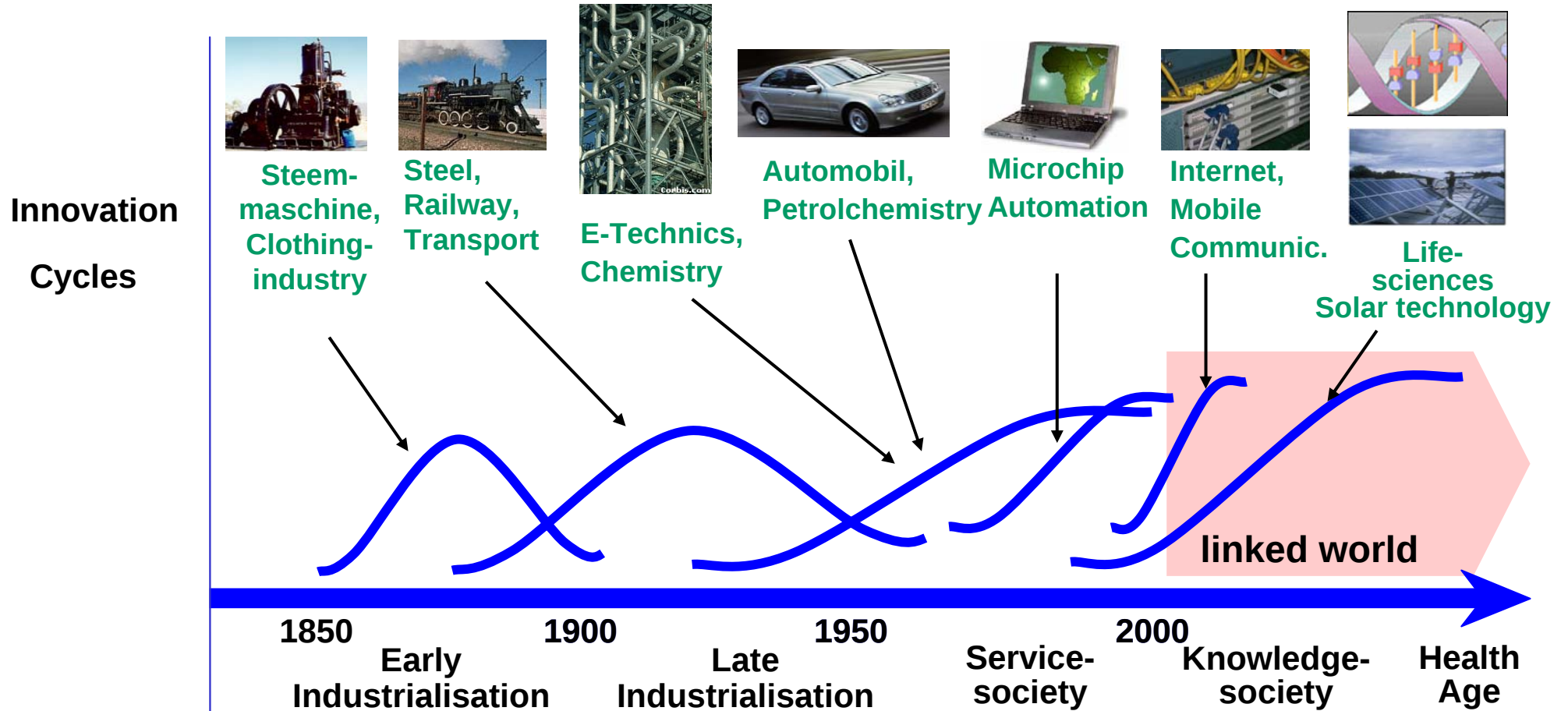
Early identification of developments at work and of new skill needs



Early identification of new developments facilitates an proactive and timely response to changes.

Kondratieff-Cycles: **Key Innovations ...**

► ... initiate new industrial and social stages of development



Source: similar in Nefiodow in Capital 1/2 2000



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Emerging Technologies

New Skill Needs in the field of Nanotechnology

International workshop, 11 - 12 July 2005, Stuttgart

In the workshop and in the working groups we deal with the following questions:

- What are the trends in the sector of nanotechnology and how do they affect skill needs and occupational profiles?
- How can we identify future skill shortages and gaps in emerging technologies?
- What are specific shortages and gaps already identified/estimated for the nanotechnology sector?
- How can skill shortages / skill gaps be tackled and possibly prevented?