

**Engineering Management BMEVITMMB03**

BME Fac. EE &IT MSc Majors

Economic & human themes

# **Technology Foresight**

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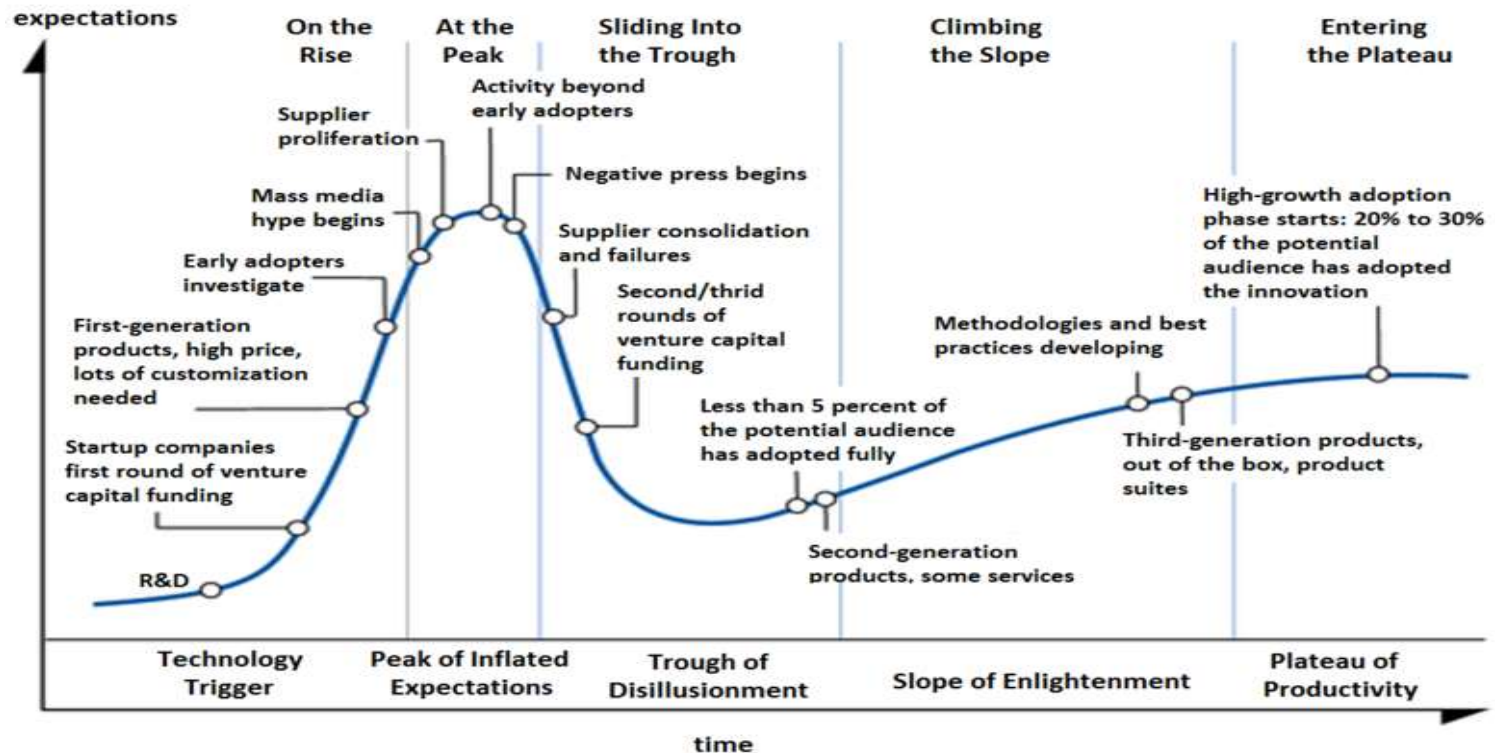
**BME Dept. Telecommunications**

**and Media Informatics**

**Budapest, 2024 spring**

# Hype Cycle according to Gartner

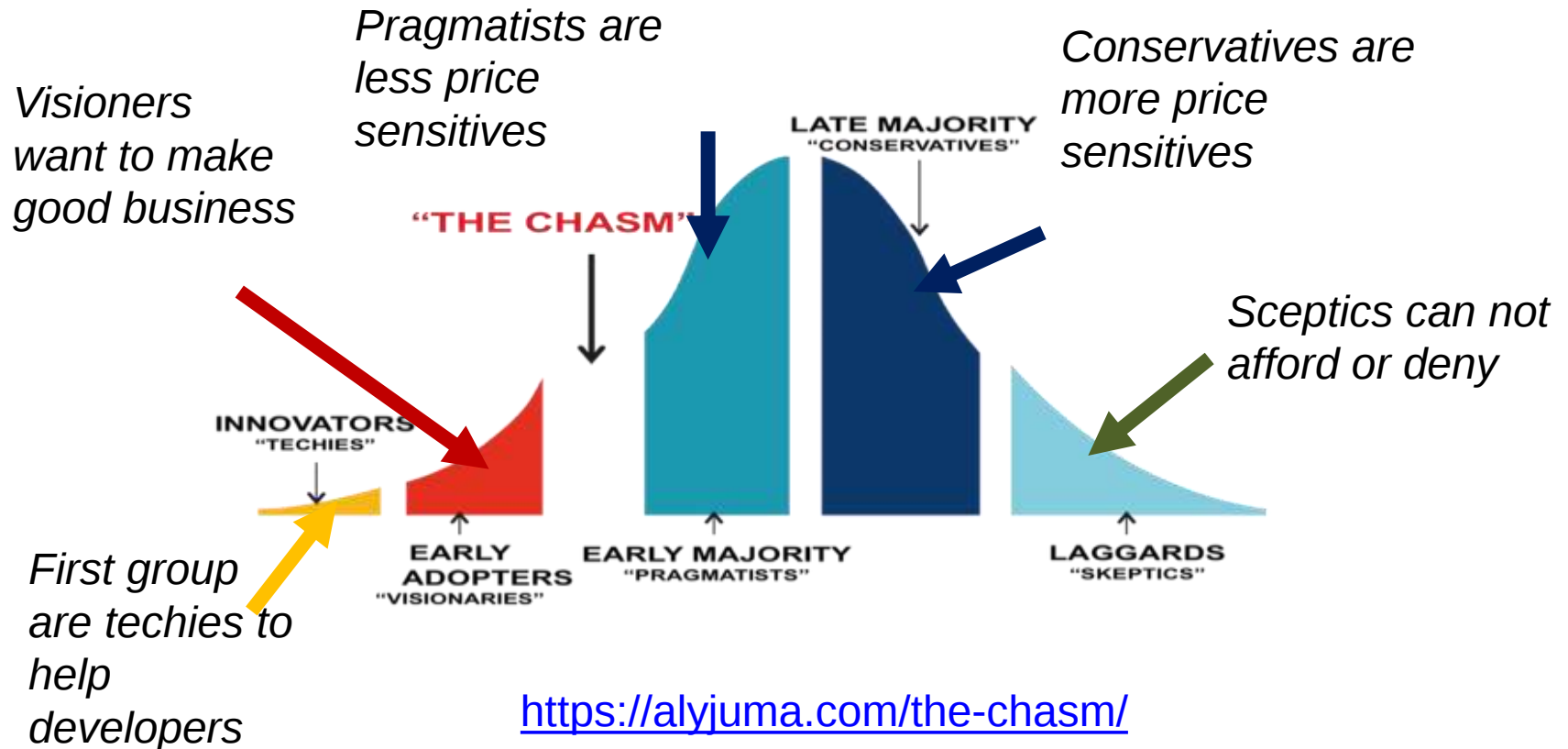
*How new technologies come into the market?*



*What is the best time to make investment?*

Article to read: <https://chiefmartec.com/2018/01/one-thing-everybody-forgets-gartners-hype-cycle-martech/>

# Geoffrey Moore: who accept a new technology based product



# When to invest into a new technology?

## Early phase?

- Technology is not matured yet
- There are over expectations
- Lack of business model
- First on the market
- May become „De facto” standard
- Risk is high
- Return can be high

## Matured phase?

- Technology is already proved
- Expectations are proved
- There is a business model
- It is not first on the market
- Has to adapt others solutions
- Risk is low
- Return is much lower

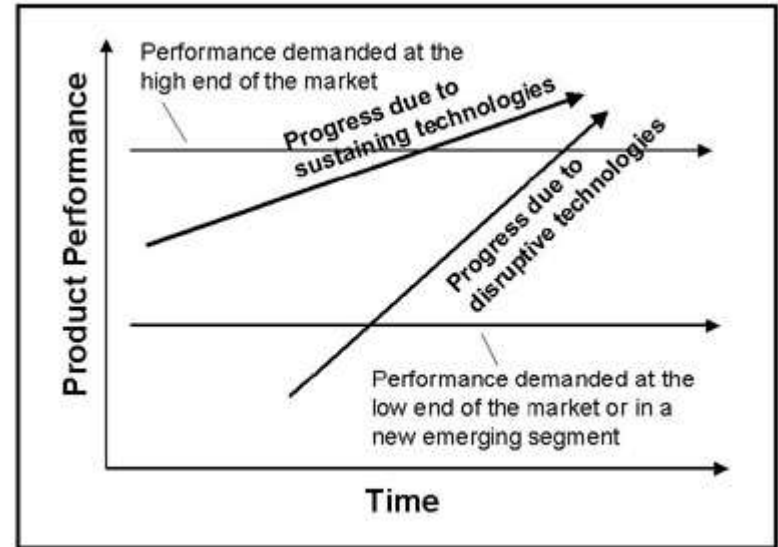
# Disruptive Technology

Disruptive technologies are generally "cheaper, simpler, smaller, and, frequently, more convenient to use."

Disruptive technologies do not initially satisfy the demands of even the high end of the market.

Disruptive technologies surpass sustaining technologies in satisfying market demand with lower costs.

This is the "Innovator's Dilemma.



[https://cio-wiki.org/wiki/Disruptive\\_Technology](https://cio-wiki.org/wiki/Disruptive_Technology)

***In technology foresight, we are interested mainly to find future disruptive technologies***

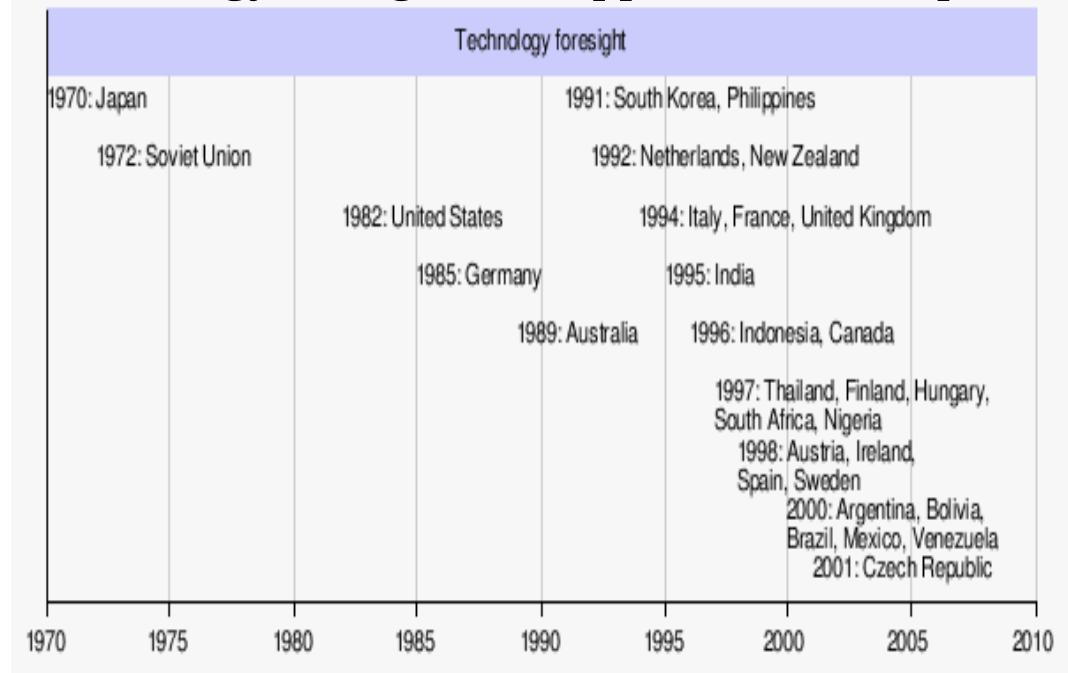
# History of Technology Foresight



Methodology  
Is spread by international  
organizations,  
like UNIDO, OECD  
IPTS

<https://www.unido.org/our-focus/advancing-economic-competitiveness/investing-technology-and-innovation/competitiveness-business-environment-and-upgrading/technology-foresight>

Systematic foresight for 10-30 years about technology changes was applied first in Japan



# Foresight Centers in the World

**Institute for the Future in Palo Alto, CA, USA**

<https://www.iftf.org/home/>

<https://www.iftf.org/our-work/people-technology/>

<https://www.iftf.org/future-now/>

**Asia Pacific Economic Cooperation (APEC)  
Center for Technology Foresight in  
Bangkok, Thailand**

• <https://www.apec.org/Groups/Other-Groups/Specialised-APEC-Centers>

• <https://apecctf.org/about-apec-ctf/>

**European Union Strategic Foresight**

[https://ec.europa.eu/info/strategy/strategic-planning/strategic-foresight\\_en](https://ec.europa.eu/info/strategy/strategic-planning/strategic-foresight_en)

**Communication to European  
Parliament on foresight**

<https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=COM%3A2021%3A750%3AFIN>

<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023DC0376&qid=1713429519381>

**Decisions based on foresight**

<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022D2481&qid=1682407819071>

**Open EU Foresight platform**

<http://www.foresight-platform.eu/>

# Foresight in Hungary & Central-Eastern European Region

**Foresight as a key enabler of innovation in the economy**

<https://www.springeropen.com/collections/foresight>

**The future of business in Visegrad region**

<https://eujournalofuturesresearch.springeropen.com/articles/10.1007/s40309-016-0103-3>

**Technology Foresight in Hungary: Objectives, methods, results and lessons**

[https://www.researchgate.net/publication/301559542\\_Technology\\_Foresight\\_in\\_Hungary\\_Objectives\\_methods\\_results\\_and\\_lessons](https://www.researchgate.net/publication/301559542_Technology_Foresight_in_Hungary_Objectives_methods_results_and_lessons)

**ICT prospective forecasting project in Hungary 2005-2010**

*Results are in a book in Hungarian*

[http://bookline.hu/product/home.action?id=77077&type=22&v=Domolki\\_Balint\\_szerk\\_Egen\\_foldon\\_informatika](http://bookline.hu/product/home.action?id=77077&type=22&v=Domolki_Balint_szerk_Egen_foldon_informatika)

# Technology Foresight



## What to prepare?

- Newsletter or Blog
- Focused technology analysis
- Vision of a usage area
- Trend analysis
- *Strategy suggestion (sometimes)*

## How to do it?

- Collect information,
- Understand & compress it,
- Some intuition is needed

## Why to do it?

- Research funding
- Basis for investment decision

## Who will be the user?

- Decision makers
- Investors
- Experts

## Further Introduction

- <http://emergentbydesign.com/2010/06/15/essential-skills-for-21st-century-survival-part-4-foresight/>

# Methodology for Technology Foresighting

## Workflow:

- Scope of studies
- Collecting, understanding and compressing information,
- Starting study
- Consultation and questionnaire with experts (*Delphi method*)
- Iteration with the completed study

## Products:

- ☐ Focused technology study („Deep drill“)
- ☐ Vision of a usage area
- ☐ Newsletter / Blog
- ☐ Technology radar
- ☐ Presentations for a professional community
- ☐ Communication with the experts and the professional community

# On-line text analysis

Define the scope of the study for foresight

Collection of relevant information within the scope of technology

- News, research report, call for papers of a Conference or workshops
- Articles, books, publications
- Definitions, authors name, key words collection

Compressing the information:

- The scope of the topic
- Present situation
- Ongoing research, expected results

Think further the topic:

- Expected development
- Different scenarios in the future

*Result: good questions for Delphi method*



# „Delphi” method

*This is a method to catch the collective tacit-knowledge:*

- a. Define the scope of the study
- b. Invite the experts of the topic, because each expert has a vision about his/her core business area
- c. Ask them systematically and collect their answers
- d. Select the gained answers into two main groups: where they agree and where they disagree with each others
- e. Topics, where they agree will be the most probable future
- f. Topics where they disagree, provide the different scenarios of the future
- g. *Repeat the method if it is needed*



*DELPHOI in Grece,  
the foresighting temple*

# Focused technology study

## Template

- *Thesis: message into the first sentence*
- Scope
- Present situation
  - Parts of the scope
  - Stakeholders
  - Existing conflicts
- Ongoing research
- Most probable development of technology
- Prequisites and consequences to other technologies
- Domestical situation
- Summary



# Vision of a usage area

## Use Template:

- ❖ First sentence should be the main message
- ❖ Scope
- ❖ Present situation
- ❖ Influencing factors using
- ❖ PEST methodology
- ❖ Analysis of influencing factors:
  - Relations to the examined area,
  - Relations among the factors
  - Strong and weak effects
  - Uncertainties related to the vision of the influencing factors

## Visions made:

- Vision of Intelligent factors
- Vision of the workflow in offices
- Vision of intelligent transport systems
- Vision of information technology of learning

*Professional communication with the experts*



# Analyze influencing factors: PESTEL method

- Influencing factors have direct or indirect connection to the examined area
- These factors have connections with each others

**P**= Political (decision based)

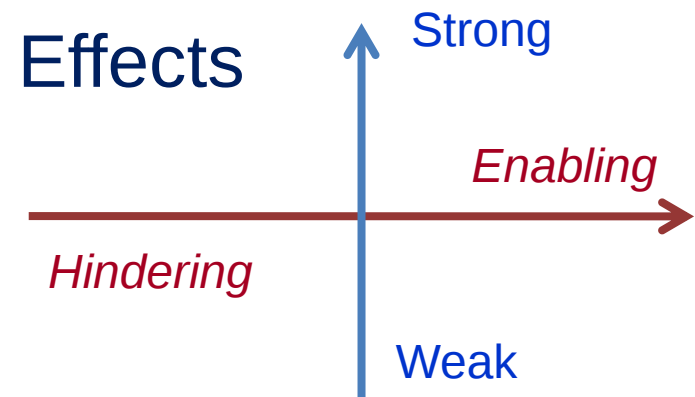
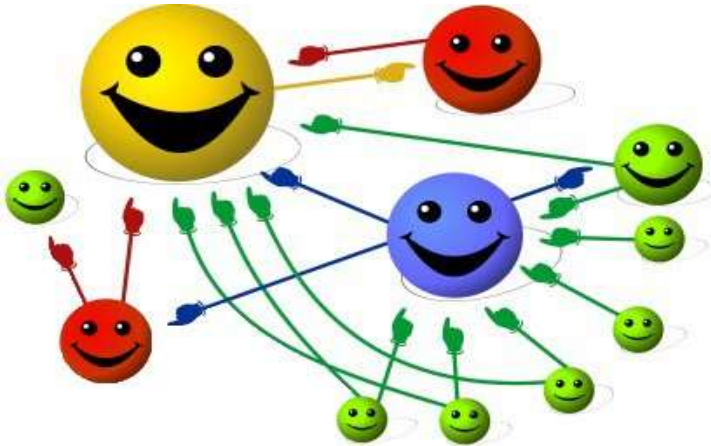
**E**= Economic (investments, viability)

**S**= Social (spontaneous trends)

**T**= Technology offers

**E** =Ecological (natural environment)

**L** = Legal (legislation, agreements)



# Variations in vision: scenarios

## Main vision

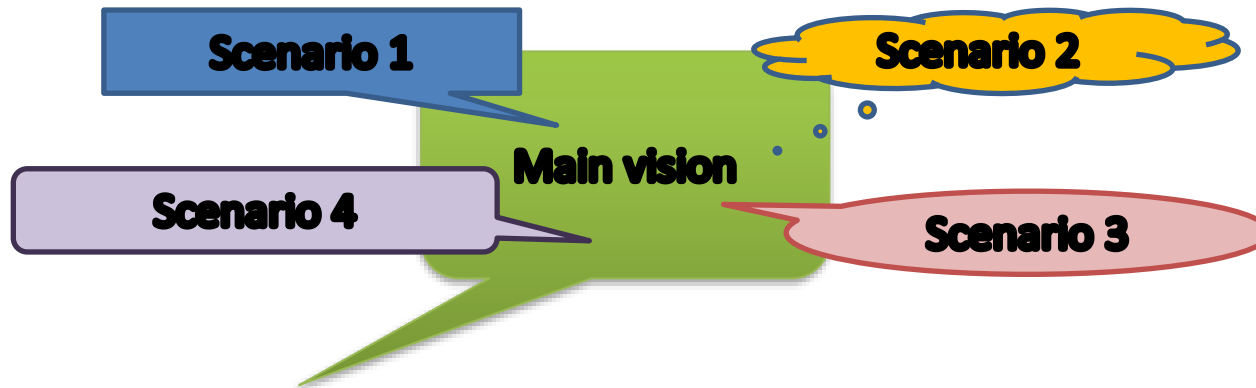
Effects of well defined and well determined,

strong influencing factors:

Descriptions may start with:  
„we expect, that...”

## Scenarios

- Variations on the main vision
- Effects of well defined but uncertain strong factors
- Description starts with „If then”



# Roadmaps, illustrations

Roadmaps show the route from present situation to the vision, including different scenarios

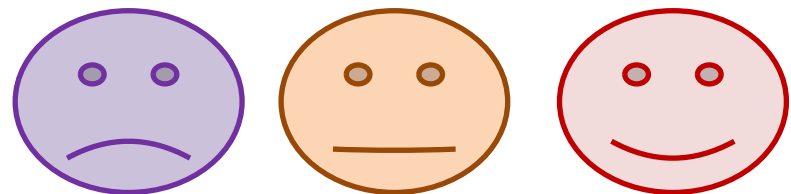
*What should happen to achieve the future situation?*

To ascertain future situation there may be more than one roadmap

Illustration about a future situation:

- News for the future newspapers
- Description of a situation or a conversation in the future
- Pictures or drawings

*Reality examination*



# Uncertainty: Wild Cards, Weak Signals remaining unexpected events & changes

| Main features                     | Wild Cards (unexpected)                                                                           | Weak Signals (changes)                                                                                                                            |
|-----------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Probability and occurrence</b> | Have low probability of occurrence                                                                | Have little importance at the time of occurrence and a substantial lag time before becoming a mainstream                                          |
| <b>Consequences</b>               | Have high impact and immediate strategic consequences for an organization or society              | Predict future changes /strategic discontinuities/ paradigm shifts/ developments in technologies, societal, innovations, conflicts                |
| <b>Potential for detection</b>    | Do not fit into the usual frame of reference and change the concept of the ordinary way of things | Constitute raw informational material (unstructured, fragmented, incomplete and inadvertent bits of information) for enabling anticipatory action |
| <b>Impact</b>                     | Considered as serious, destructive, catastrophic or anomalous events                              | Hidden among the “noise” of the prevailing sense making paradigm and not easily verifiable from a present-day perspective                         |

[https://www.researchgate.net/publication/258257442\\_Playing\\_the\\_Wild\\_Card](https://www.researchgate.net/publication/258257442_Playing_the_Wild_Card)

[https://www.researchgate.net/publication/251724953\\_The\\_strategic\\_strength\\_of\\_weak\\_signal\\_analysis](https://www.researchgate.net/publication/251724953_The_strategic_strength_of_weak_signal_analysis)

# Strategy making based on technology foresight

Select from the future scenarios:

- The best
- The most probable
- The most undesirable

Prepare the company to these scenarios now!!!

Study about scenario making:

[http://www.die-gdi.de/CMS-Homepage/openwebcms3.nsf/%28ynDK\\_contentByKey%29/ANES-7LZJRH/\\$FILE/Studies%2039.2008.pdf](http://www.die-gdi.de/CMS-Homepage/openwebcms3.nsf/%28ynDK_contentByKey%29/ANES-7LZJRH/$FILE/Studies%2039.2008.pdf)

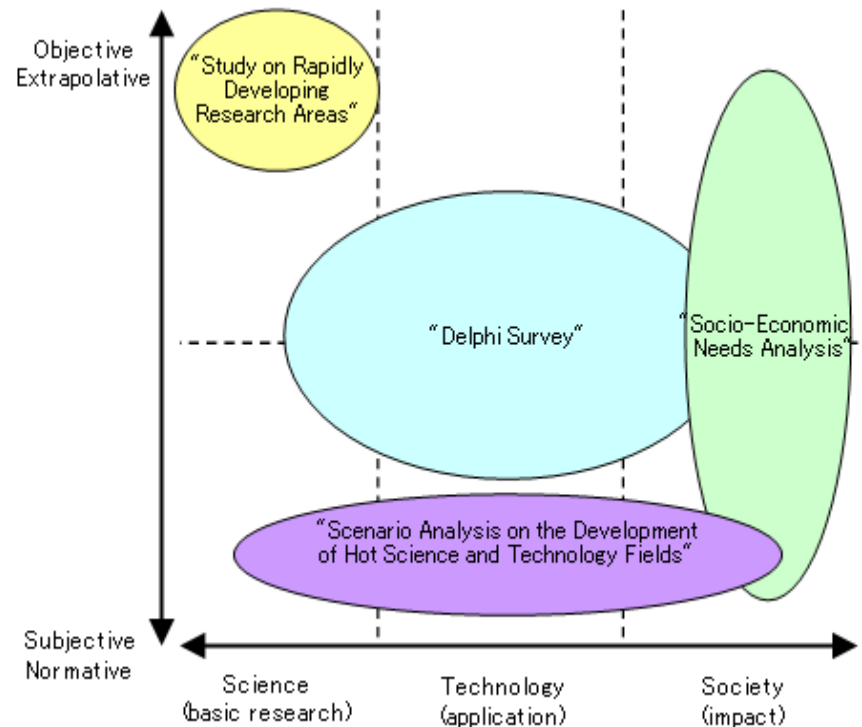
„Backward scenario building”

- Business strategy is based on long term visions
- The business goals for 5 years are based or influenced by the 10-30 year technology foresights

# Summary

## Technology foresight

- is made for decision makers or their experts,
- It makes long term analysis for 10-30 years,
- It can be made using all information available,
- Including the tacit knowledge of expert community,
- It can be a basis for backward scenario making for strategy



**Research on Science and Technology Foresight** by Science and Technology Foresight Center

<http://www.nistep.go.jp/nistep/about/thema/the maA-e.html>