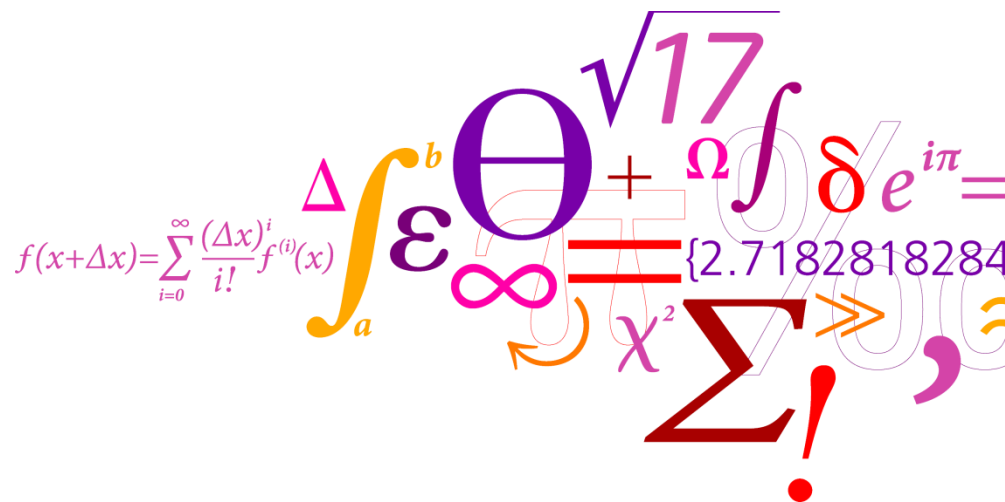# National contexts of science foresight.
The case of the Danish RESEARCH2015 project

**ESF Member Organisation Forum on
"Science Foresight for Joint Strategy Development"**

3rd Workshop, Paris, France, 17-18 January 2012

Prof. Per Dannemand Andersen

pean@dtu.dk

$$f(x+\Delta x)=\sum_{i=0}^{\infty}\frac{(\Delta x)^i}{i!}f^{(i)}(x)$$

DTU Management Engineering
Department of Management Engineering

Overall aim of the presentation

To contribute to the Forum's discussion on specific characteristics of science foresight

- with particular focus on national contexts of weak traditions for science foresight

**DTU Management Engineering,
Technical University of Denmark**

The presentation

1. How I understand foresight

2. National contexts of foresight
   - National governance culture

3. Danish context and governance culture
   - Danish traditions and styles in governmental long range planning and policy making
   - The Danish Globalisation Strategy and the R&D funding system

4. Case: the RESEARCH2015 project

5. Conclusions

**DTU Management Engineering,
Technical University of Denmark**

Roots of today's practice of foresight

American tradition on <u>technology forecasting</u> from 1940s and 1950s
• American experiences from defence and aerospace
• A linear understanding of innovation
• Experts point of view (elite scientists and industrialists)
• Positive and positivistic view on development and the future
• Engineering and econometrics

European tradition on <u>futures studies</u> from 1960s and 1970s
• European experiences from dealing with grand societal challenges
• Futures studies as an art
• (Participatory,) creative and imaginative thinking and acting
• Pessimistic view on development and technology
• Humanities and social sciences

International tradition on <u>foresight</u> developed since mid-1980s
• International experiences from national foresights exercises for priority-setting in science, technology & innovation (STI) policy
• Starting with Japan, Germany, France, Korea and UK
• Reflecting new understandings of
    • innovation and innovation policy
    • strategic planning
    • science's role in society

Evolution of the understanding of foresight

1980s (1983)

- *".. a convenient shorthand for efforts to <u>identify</u> "which <u>research areas</u> are likely to lead to the greatest economic and social benefits""*

<div align="right">(Martin, 2010)</div>

1990s

- *".. the <u>process</u> involved in <u>systematically</u> attempting to look into the <u>longer-term future</u> of science, technology, the economy and society with the aim of identifying the areas of <u>strategic research</u> and the emerging generic technologies likely to <u>yield</u> the greatest economical and social benefits"*   (Martin, OECD, 1996)

2000s

- *".. a systematic, <u>participatory</u>, future-intelligence-gathering and medium-to-long-term vision-building process aimed at enabling present-day decisions and <u>mobilising joint actions</u>"*

<div align="right">(European Foresight Platform, 2011)</div>

National contexts of foresight - 1

The presentation relates to two issues discussed in current academic literature on foresight and in the international foresight community.

- The integration of foresight in policy-making processes.
- *How to achieve that science foresight projects have impact on real life policy making?*

- The decisive context of policy-making in which science foresight is carried out.
- *What is the decisive context ?*
  - *Size of country? Large countries vs small countries*
  - *Geographical regions? E.g. North-West Europe or Asia*
  - *Political tradition or Governance culture?*

**DTU Management Engineering,
Technical University of Denmark**

National contexts of foresight - 2
Different regional styles in foresight (Keenan&Popper, 2008)

Factors explaining regional foresight styles:

- Contextual landscape
  - Established democracies (e.g. Northwest Europe and North America
  - Third wave democracies (e.g. Southern and Eastern Europe and South America
  - Asian democracies (e.g. Japan)

- History of foresight diffusion and adoption

6 regions:

- Northwest Europe

- Eastern Europe

- Southern Europe

- North America

- South America

- Asia

(Keenan & Popper 2008)

National contexts of foresight - 3
Geert Hofstede´s four dimensions of cultures

Power Distance

The extent to which the less powerful members of organizations and institutions accept and expect that power is distributed unequally.

Uncertainty Avoidance

Tolerance for uncertainty and ambiguity; it ultimately refers to man's search for Truth.

Masculinity

Refers to the distribution of roles between the genders which is a fundamental issue for any society to which a range of solutions are found.

Individualism

The degree to which individuals are integrated into groups.

**DTU Management Engineering,
Technical University of Denmark**

National contexts of foresight – 4
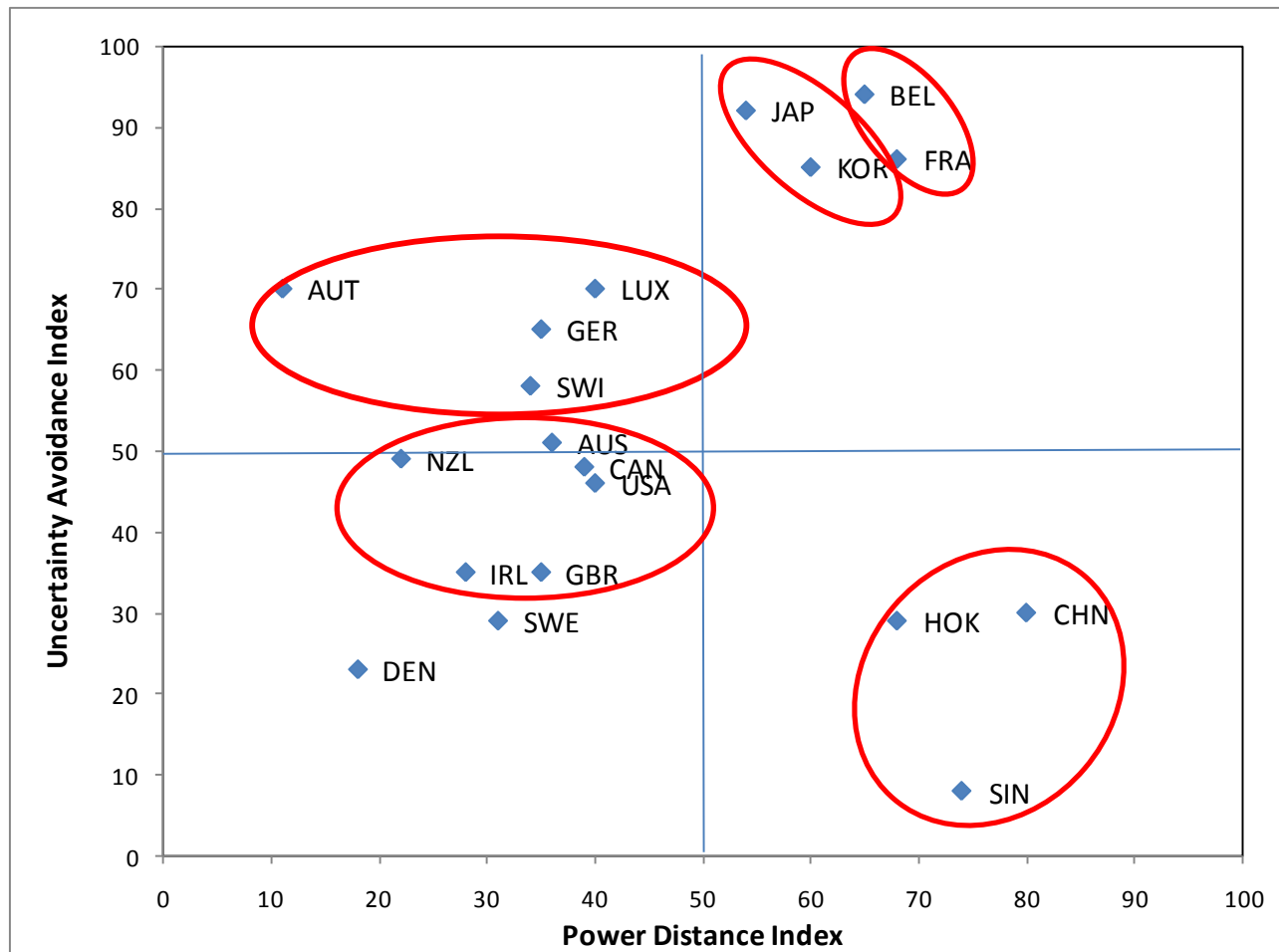## Implications for foresight activities (based on Hofstede, 1984)

Power Distance

• Need for subordinate consultation

Uncertainty Avoidance

• Types of planning used

• Meaning of time

• Tolerance for deviant ideas

**DTU Management Engineering,
Technical University of Denmark**

National contexts of foresight - 5
Different styles also in NW Europe (based on Hofstede, 1984)

**DTU Management Engineering,
Technical University of Denmark**

The Danish context – 1
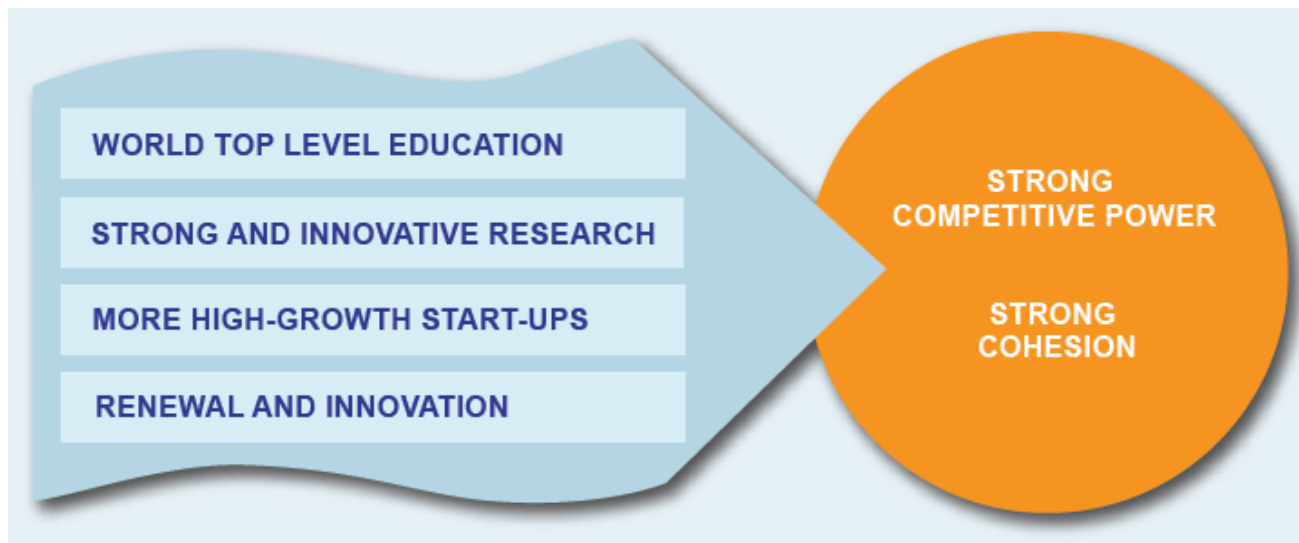## Weak tradition for science foresight

Denmark was NOT among the first countries to adopt foresight. This may be
due to several reasons:

- Denmark have "..weak *traditions for basing political decisions on accessible
  knowledge – as opposed to Sweden, for instance. The scientific/analytical
  level in Danish white papers has generally been low. White papers have
  often seemed negotiated rather than analytical presentations of political
  issues"* (Togeby et al., 2003)

- Negative experiences with prospective planning (Perspektivplan I and II)
  during the 1970s

- SME dominated industry focussing on rapid response to change rather than
  on long-term planning and R&D, BUT that has changed

- Science and technology have traditionally played a less important role
  compared to other OECD countries, BUT that has changed

**DTU Management Engineering,
Technical University of Denmark**

The Danish context – 2
Government's Globalisation Strategy from 2006

- "an ambitious and pro-active strategy to gear Denmark for the future"
- 350 specific initiatives, extensive reforms of
  - education and training programmes,
  - research and entrepreneurship,
  - framework conditions for growth and innovation in all areas of society.

WORLD TOP LEVEL EDUCATION

STRONG AND INNOVATIVE RESEARCH

MORE HIGH-GROWTH START-UPS

RENEWAL AND INNOVATION

STRONG COMPETITIVE POWER

STRONG COHESION

Source: www.globalisering.dk (English text available)

The Danish context - 3
- the Goverment's Globalisation Strategy from 2006

**Key initiatives in public sector R&D**

- More funds for public sector research - 1% of GNP in 2010
- 50% % of research funds should be subject to competition
- New models for competition between universities
- Research grants should cover all costs
- Greater number of large, long-term grants
- Research grant pool for research infrastructure
- More funding toward strategic research
- Better basis for prioritising
- Quality barometer and evaluation of large-scale programmes
- Co-financing of Danish participation in international research co-operation

Source: www.globalisering.dk (English text available)

**DTU Management Engineering,
Technical University of Denmark**

The Danish context – 4
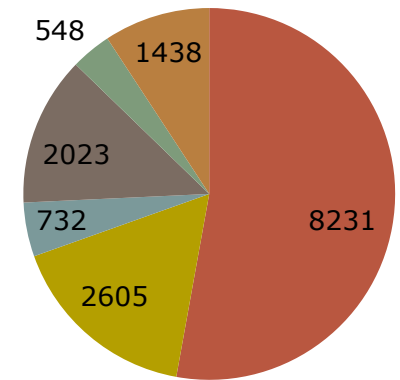## Danish public R&D expenditures

Billion DKK   1 € = 7.45 DKK   %
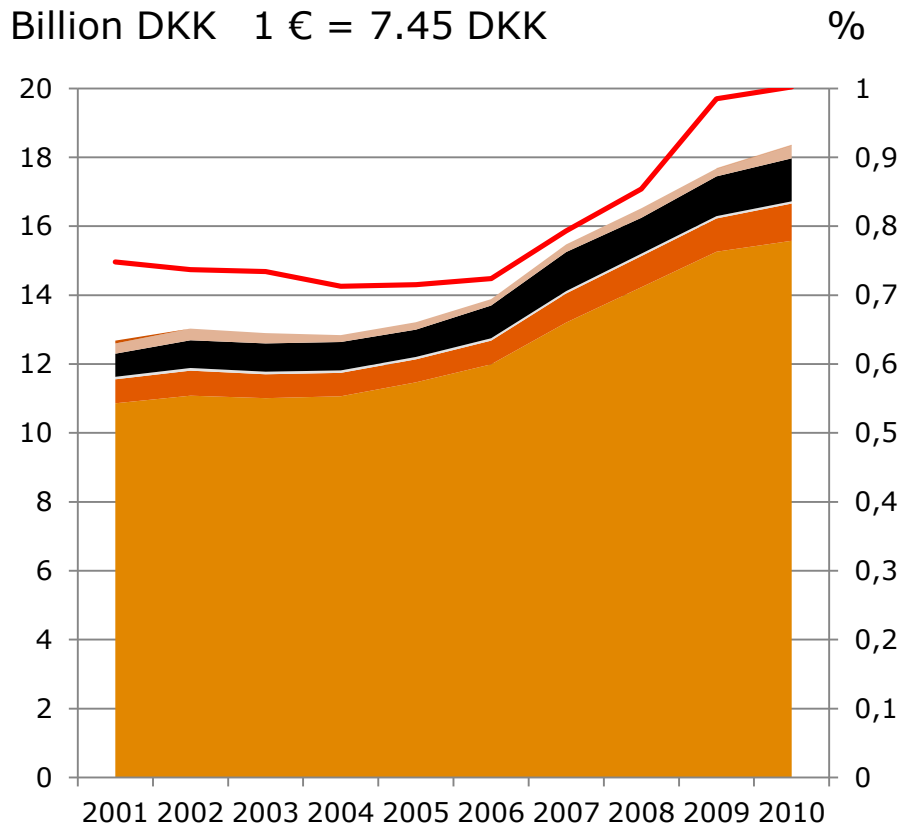
Legend:
- Growth foundation
- Danmarks National Research Foundation
- Municipal and regional budgets
- Nordic contributions
- EU contributions
- Governmental budget
- National funding in % of GNP

2010

Pie chart values: 8231, 2605, 732, 2023, 548, 1438

- Universities etc.
- Research councils
- International activities
- Other programmes
- Research institutions
- Misc.

2009 prices?

Source: Danish Agency for Science, Technology and Innovation

**DTU Management Engineering,
Technical University of Denmark**

The Danish context – 5
Summing up

- Denmark has a weak tradition for political decisions based on systematic use of expertise and accessible knowledge
- Negative experiences with prospective planning during the 1970s

- But
- Increased R&D intensity in industry and in society in general created a new need for science foresight - understood as political priority-setting of strategic research.

RESEARCH2015
- Aim and rationale

AIM

- to improve the basis for prioritisation of public funds for strategic research.

Broad political agreement in the Danish Parliament

- supported by government parties: Denmark's Liberal Party, the Conservative People's Party (& the Danish People's Party).
- and two larger opposition parties: the Social Democratic Party, and the Social-Liberal Party.
- => probably survive a change of government caused by general election

Rationale

- the basis for the political prioritisation of funds for strategic research should be improved
- the Folketing (Danish Parliament) is to be presented with a catalogue of important future strategic research themes every four years

**DTU Management Engineering,
Technical University of Denmark**

RESEARCH2015 - Overview of the process

Phase 1 Mapping

• A broad-based mapping of the of the strategic research needs created by societal and business development

Phase 2 Identification of themes

• Identification of research themes, which may form the basis of goal-oriented strategic research funding

Phase 3 Final proposal

• Preparation of final proposal through dialogue with interested parties from society at large

Phase 4 Implementation

• Negotiations about the fiscal act 2009

(Phase 5 Evaluation)

New process in 2012: RESEARCH2020

Phase 1: Mapping research needs

Aim:

- Broad mapping of the strategic research needs created by societal and business development.

Methods:

- Horizon scan by OECD's International Futures Programme Unit
    - Result: 125 suggestions for important development trends and societal challenges.

- Public internet hearing where everyone could identify important research needs and themes in Denmark.
    - Result: 366 proposals from the general public, companies, researchers, universities and organisations.

Timeframe:

- The mapping was carried through from March to October 2007.

**DTU Management Engineering,
Technical University of Denmark**

Phase 2: Identification of themes

Aim:

- identification of themes

Methods

- Expert panel
    - appointed by the Strategic research council based on suggestions from stakeholder organisations
    - grouping of proposals
    - Identification of 42 proposals for strategic research themes, which formed the starting point of a workshop with a user panel

- User panel – 1-day workshop with the expert group
    - New ideas and input

- Expert panel
    - final proposal for 31 strategic research themes

**DTU Management Engineering,
Technical University of Denmark**
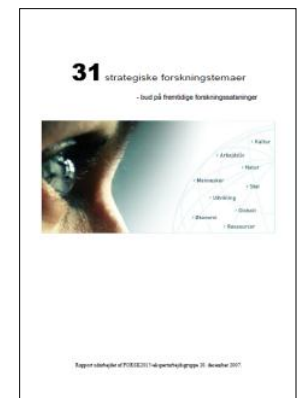
Phase 2: Identification of themes
- the user panel

- 53 key representatives of user of strategic research
  - Industry
  - Trade unions
  - Universities
  - NGOs
  - Municipalities and regional authorities
  - Ministries and government agencies

- Businesses and organisations proposed candidates for the user panel.

- The use panel was appointed by the Danish Agency for Science Technology and Innovation in consultation with The Danish Council for Strategic Research.

**DTU Management Engineering,
Technical University of Denmark**

Phase 3: The final proposal

Aim:

• Catalogue containing proposals for strategic research effort areas.

Method:

• Dialogue meetings between the expert panel and stakeholders from organisations, ministries, strategic research council
  – Strategic research council contributed with editing the text
• Two-day workshop with the Councils for Independent Research
  – assessment of the qualifications of the Danish research environments for conducting a research within each of the proposed themes.

Result:

•   21 proposals for strategic research themes

Phase 3: The final proposal – the 21 priorites

Energy, climate and the environment
- Energy systems of the future
- Future climate and climate adaption
- Competitive environment technologies

Production and technology
- Bio resources, food and bio products
- Intelligent solutions for society
- Production systems of the future
- Strategic growth technologies

Health and prevention
- From basic research to individualised treatment
- Chronic disease between prevention and rehabilitation
- Human health and safety in the interaction with environment factors
- Healthy lifestyle – what creates change?

Innovation and competitiveness
- Denmark's competitiveness
- Innovation
- The public sector of the future

Knowledge and education
- Education, learning and competence development
- What works? Evidence in practice
- Knowledge production and dissemination of knowledge in society

People and societal design
- Sustainable transport and infrastructure
- Better life-space – space for life and growth
- Cultural understanding in a globalised world
- Changing lives

**DTU Management Engineering,
Technical University of Denmark**

Phase 4 Implementation in the national budget for strategic research
- 383 mill. DKK in 2009; 624 mill DKK in 2010

Topic	Budgets in mill. DKK	
	'09	'10
Energy, climate and environment		
• Energy systems of the future	190	455
• Future climate and climate adaptation	43	0
• Climate research center in Greenland	20	15
• Competitive environmental technologies	10	0
Production and technology		
• Bio-resources, food and other bio products	45	50
• Intelligent solutions for society	0	10
Health and prevention		
• From basic research to individualized treatment	30	20
• Human health and safety in interaction with env. factors	0	19
Innovation and competitiveness		
• The public sector of the future	0	15
Knowledge and education		
• What works? – Evidence in practice	20	0
People and societal design		
• Sustainable transport and infrastructure	25	0

**DTU Management Engineering,
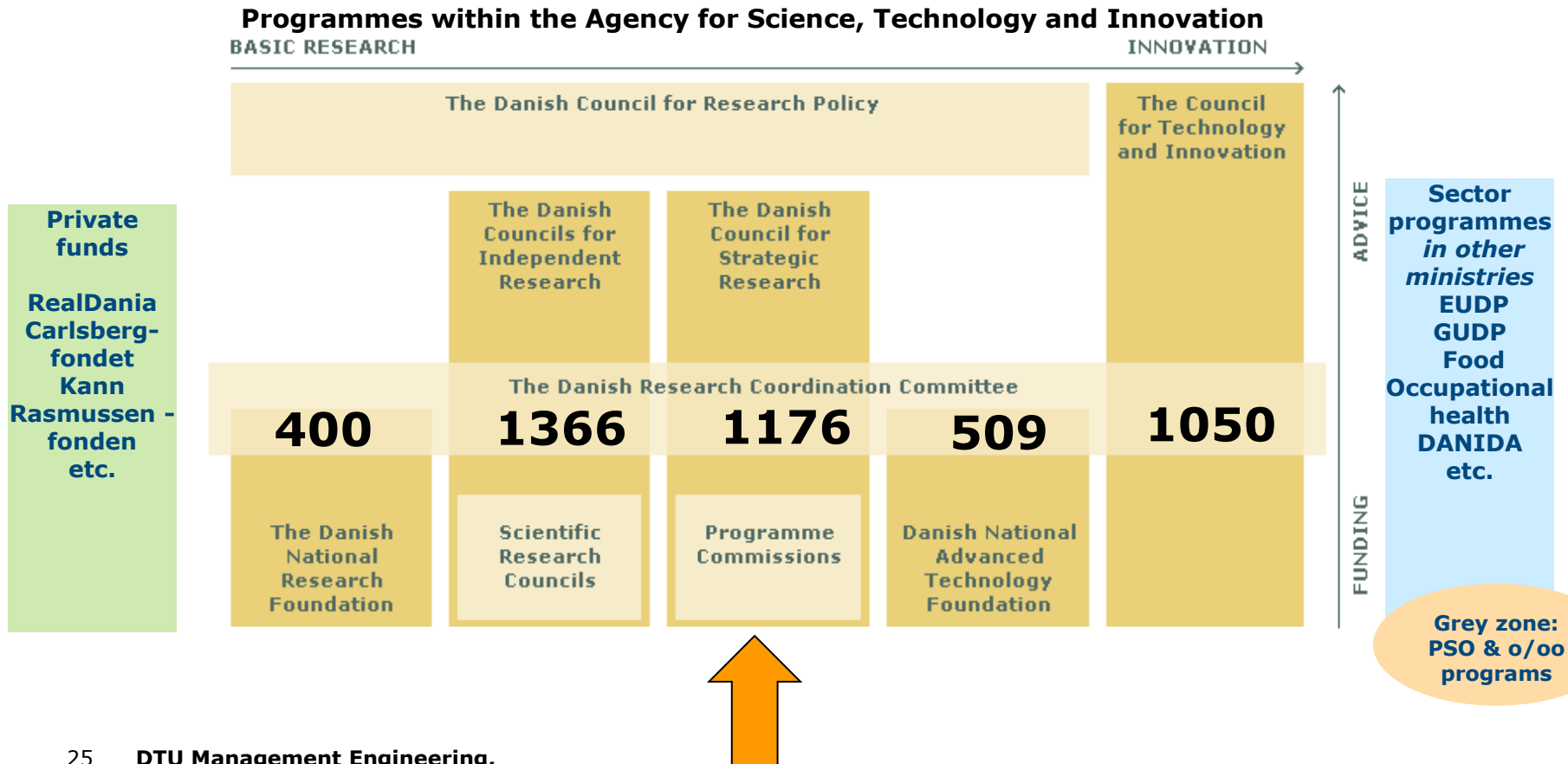Technical University of Denmark**

Phase 4 Implementation

Strategic Research Council coins out the priorities

- decides whether to form new Programme committees or let existing committees
- together with the programme committees writes the exact call text and evaluate proposals

**DTU Management Engineering,
Technical University of Denmark**

The advisory and funding system for R&D
- with 2010 budgets in millions DKK

1 € = 7.45 DKK

Programmes within the Agency for Science, Technology and Innovation

BASIC RESEARCH → INNOVATION

Private funds

RealDania Carlsberg-fondet Kann Rasmussen - fonden etc.

The Danish Council for Research Policy

The Council for Technology and Innovation

The Danish Councils for Independent Research

The Danish Council for Strategic Research

ADVICE

Sector programmes *in other ministries* EUDP GUDP Food Occupational health DANIDA etc.

The Danish Research Coordination Committee

400   **1366**   **1176**   **509**   **1050**

FUNDING

The Danish National Research Foundation

Scientific Research Councils

Programme Commissions

Danish National Advanced Technology Foundation

Grey zone: PSO & o/oo programs

DTU Management Engineering, Technical University of Denmark

RESEARCH2015 - Inclusion

Phase 1 Mapping

• All stakeholders could participate in the internet hearing (432 proposals)

• <10% were citizens without affiliation to research and interest groupings

Phase 2 Identification of themes

• Expert panel: 8

• User panel: 53

Phase 3 Final proposal

• Strategic Research Council: 14

• Independent Research Council: 18

• Contacts in other ministries: 16

• Industry associations and other organisations: 23

• Chairman of the Association of Danish Universities: 1

Phase 4 Implementation

• Science spokesmen from the political parties behind the agreement: 5

DTU Management Engineering,
Technical University of Denmark

RESEARCH2015 - Resources
- estimation of the invested time (hours)

Research councils	~ 1700
Stakeholder organisations	~ 1600
Ministries	~ 1900
User panels	~ 650
Expert group	~ 1200
Participants in internet hearing	~ 2200
In total	~ 9000 hours

Source: Teknologisk Institut, 2009

**DTU Management Engineering,
Technical University of Denmark**

Conclusion - 1
- characteristics of foresight methods in RESEARCH2015

Expertise oriented

• expert panels
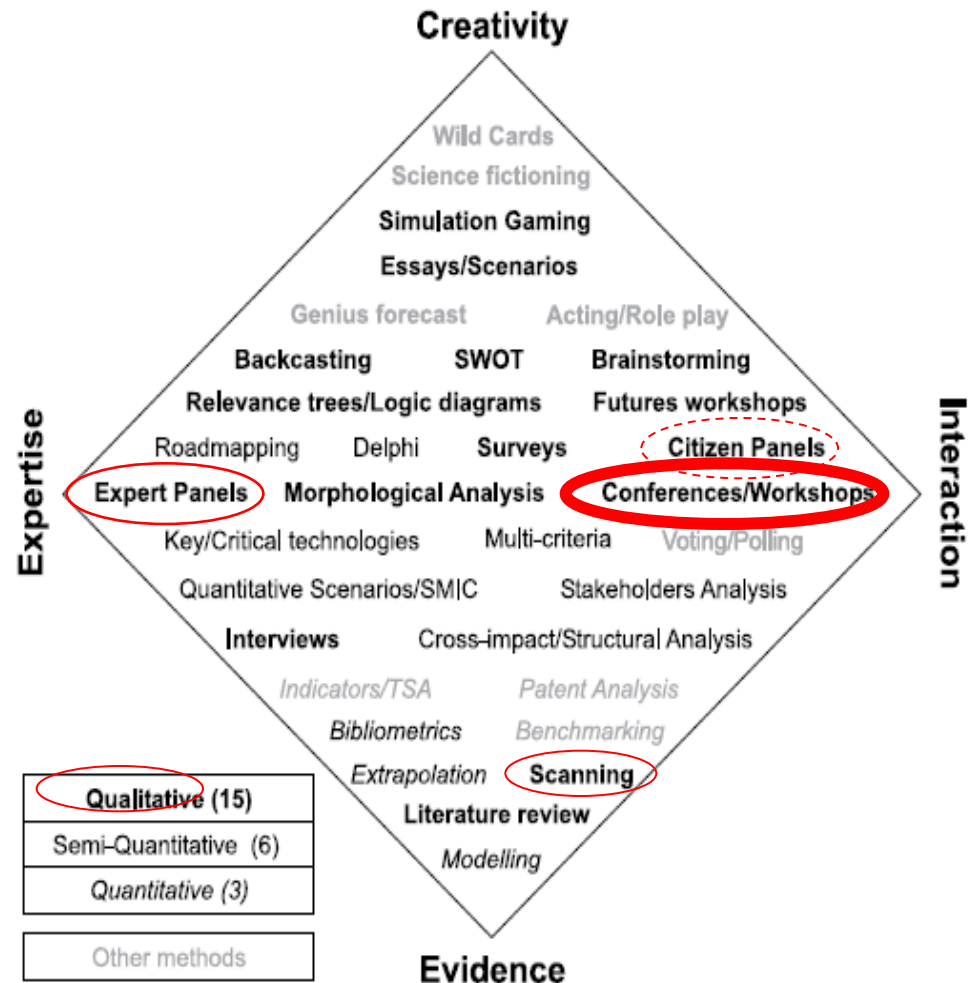
Interaction oriented

• Internet-based hearing
• user panels
• dialogue meetings
• conference
• workshops
• citizen inclusions

Evidence oriented

• horizon scanning

Creativity

• *research proposals?*

Popper's diamond: Popper, 2008

**DTU Management Engineering,
Technical University of Denmark**

Conclusion – 2
- Science foresight in the Danish context of a weak foresight tradition

A Danish style in using foresight in shaping and defining research agendas?

- Most important methods were interaction oriented: workshops, internet hearings, user panel, dialogue meetings
- This reflects *low power distance* societies need for subordinate consultation.

- The society's *weak uncertainty avoidance* do not promote strategic planning such as priority-setting of strategic research.
- But this might have been compensated for through:
  - An openness for new and deviant ideas and persons (in principle?)
  - The very interactive and consensus-seeking process.

- Rather than a systematic and structured foresight process of analysing grand challenges and devising a clearly argued research strategy, the RESEARCH2015 project might be perceived as a systematic and structured process of negotiations between major societal stakeholders for devising consensus on a research strategy.

**DTU Management Engineering,
Technical University of Denmark**

Thank you for your attention

**DTU Management Engineering,
Technical University of Denmark**