

# Innovation Systems and some examples of success

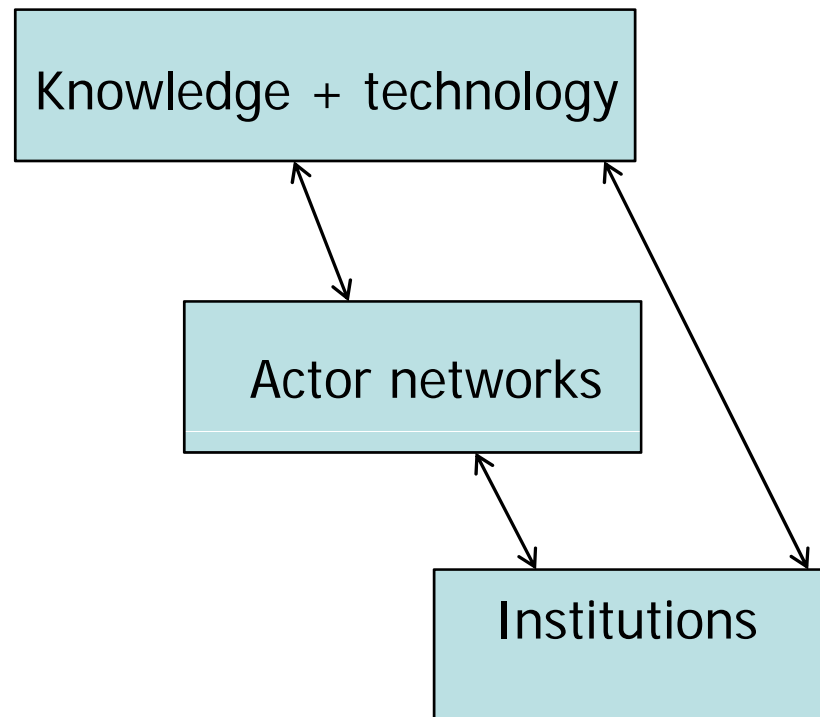
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TU Delft  
Kiev, 16 september 2011  
Presentation for the ERAIHM Seminar

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# Innovation systems

Sociotechnical configurations

within which innovations are developed and implemented



# Knowledge and technology

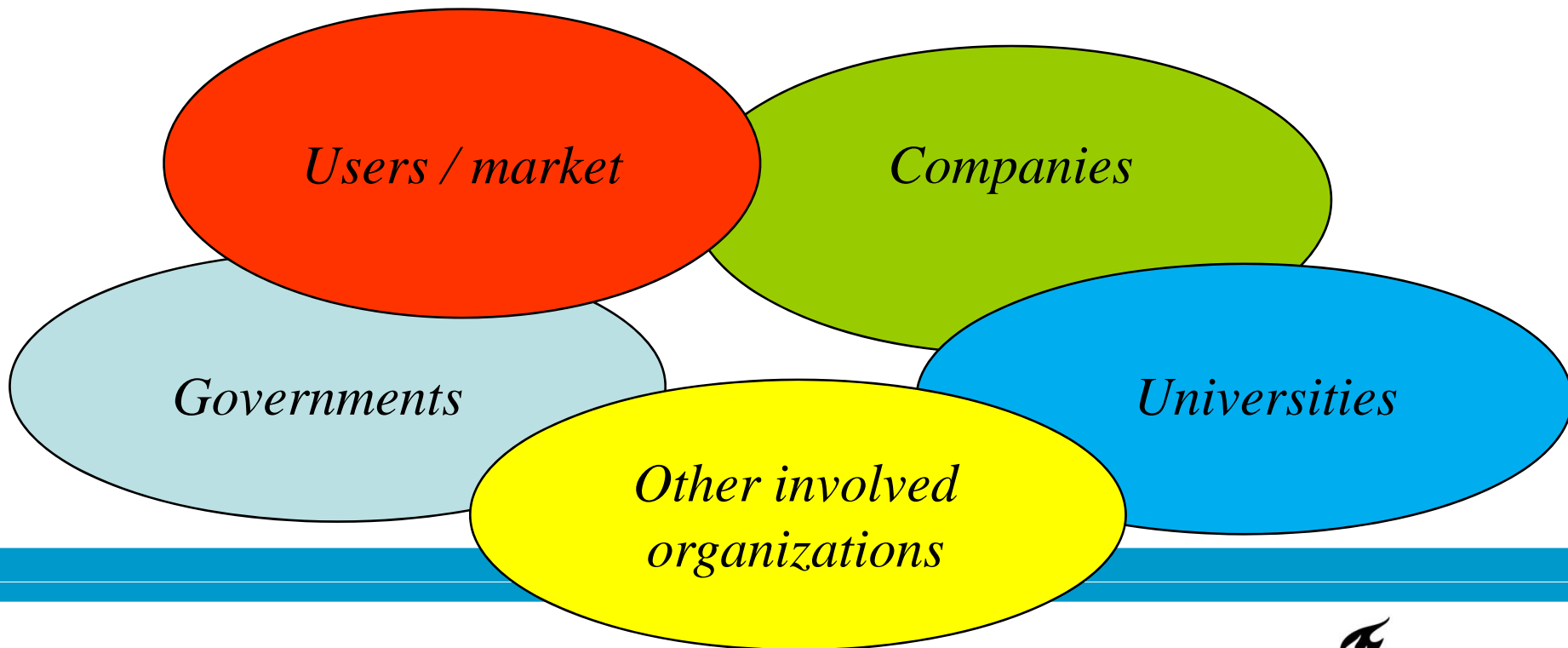
'Hardware'

Knowledge gained by:

- Learning by searching (R&D)
- Learning by doing (practical knowledge)
- Learning by using
- Learning by interacting

# Actor networks

Actors are individuals and organisations that are involved in developing and/or implementing technology



# Institutions

'Rules of the game' that influence technology development and implementation

Examples:

- Laws
- Policy measures and programs
- Formal policy goals
- Already available knowledge
- Local technical circumstances e.g. the state of the electricity grid
- Local cultural and political circumstances
- Local habits

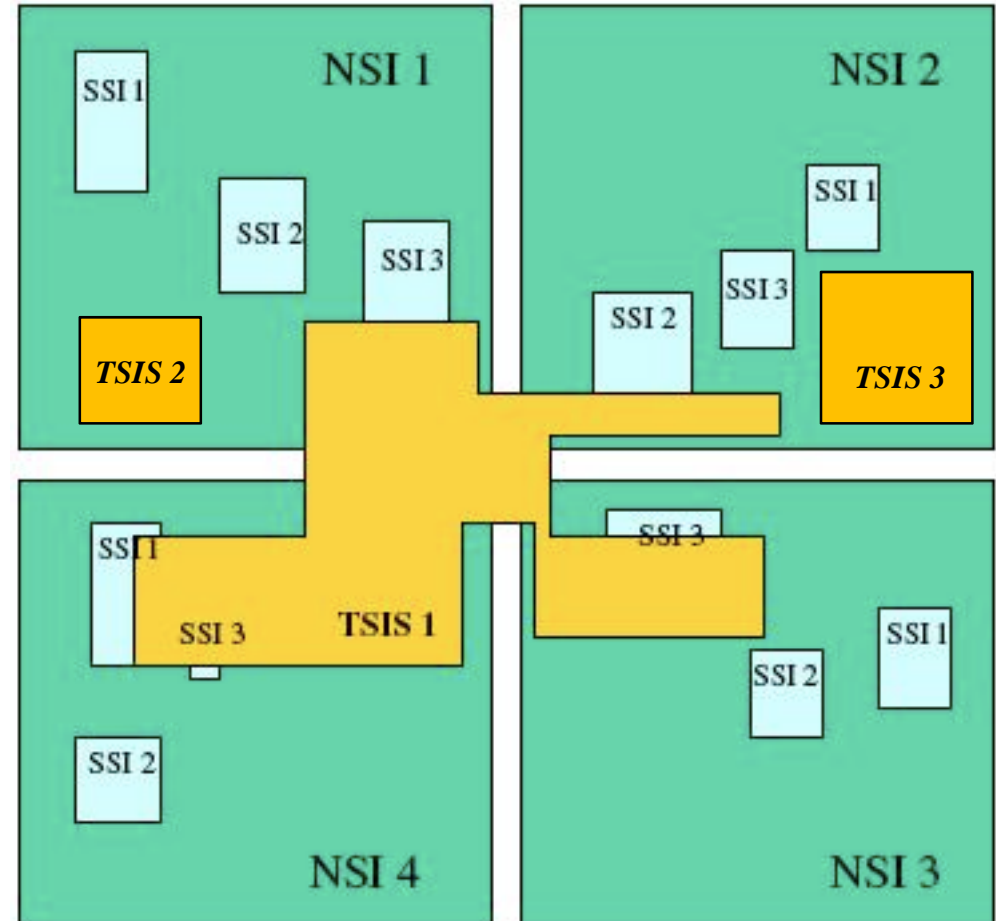
# Kinds of innovation systems

NSI: *National* System of Innovation

SSI: *Sectoral* System of Innovation

TSIS: *Technological Innovation System*

*Also possible: Regional Innovation System*



# Successful innovation systems

- Successful exchange of knowledge between different kinds of relevant actors
- Production of innovations based upon this knowledge
- Implementation of these innovations on the market
- Good match between innovations and market demand

This involves:

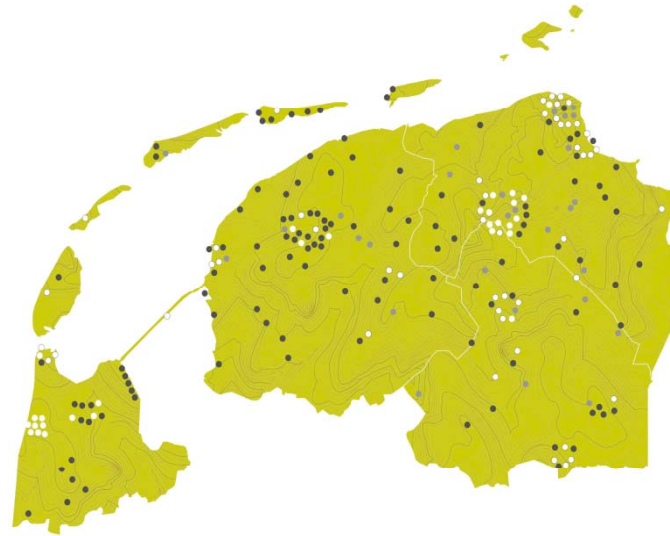
- Involvement of all relevant actors: companies, R&D institutes, market side, policy makers
- Circumstances that favour knowledge exchange
- Formation and involvement of the market
- Guidance in the forms of laws, regulations, market stimulation, etc

# Some examples of regional innovation systems

- Silicon Valley (ICT)
- In the Netherlands:
  - Eindhoven area (University, Philips, ASML)
  - 'Energy Valley' in the north of The Netherlands
  - Technopolis Innovation Park in Delft
  - Leiden BioScience Parc



# Energy Valley



## **Mission**

Energy Valley's mission is to encourage, incite, facilitate and connect companies, knowledge institutes and government bodies to develop projects together and make real progress in clean, reliable and innovative energy.

# Energy Valley

Parties involved:

- University of Groningen and polytechnic of Groningen and Leeuwarden
- 4 provinces, municipalities
- Seaport
- Utilities
- Grid owner
- Gas producer & distributor
- Consultancy agencies
- Project developers

# Energy Valley

Projects realized in recent years, among others:

- 5 wind farms
- 2 heat networks
- Green gas pilots
- Bioethanol plant
- Number of small projects

Integration of knowledge demand & supply and local/regional policy making

# Technopolis Innovation Park

- Science parc next to TU Delft in the making
- Aiming at technostarters, mainly spinn-offs from TU Delft
- Tight relationships with TU Delft researchers
- Intermediary: Yes!Delft



# Characteristics of successful regional innovation systems

- Strong networks between knowledge supply and demand
- Effective and efficient knowledge exchange
- Involvement of market side and, if relevant, policy side
- Qualified personnel available in the region
- Actors involved with marketing expertise and managerial skills

# Some examples of successful technological/sectoral innovation systems

- Wind power industry in Denmark
- PV industry in Germany and Japan

## Characteristics:

- Strong network research institutes-industry-government-demand side
- Strong knowledge diffusion between all actors
- Strong market demand stimulation and market involvement
- Clear and consistent policy context
- Availability of loans and risk capital and skilled labour force

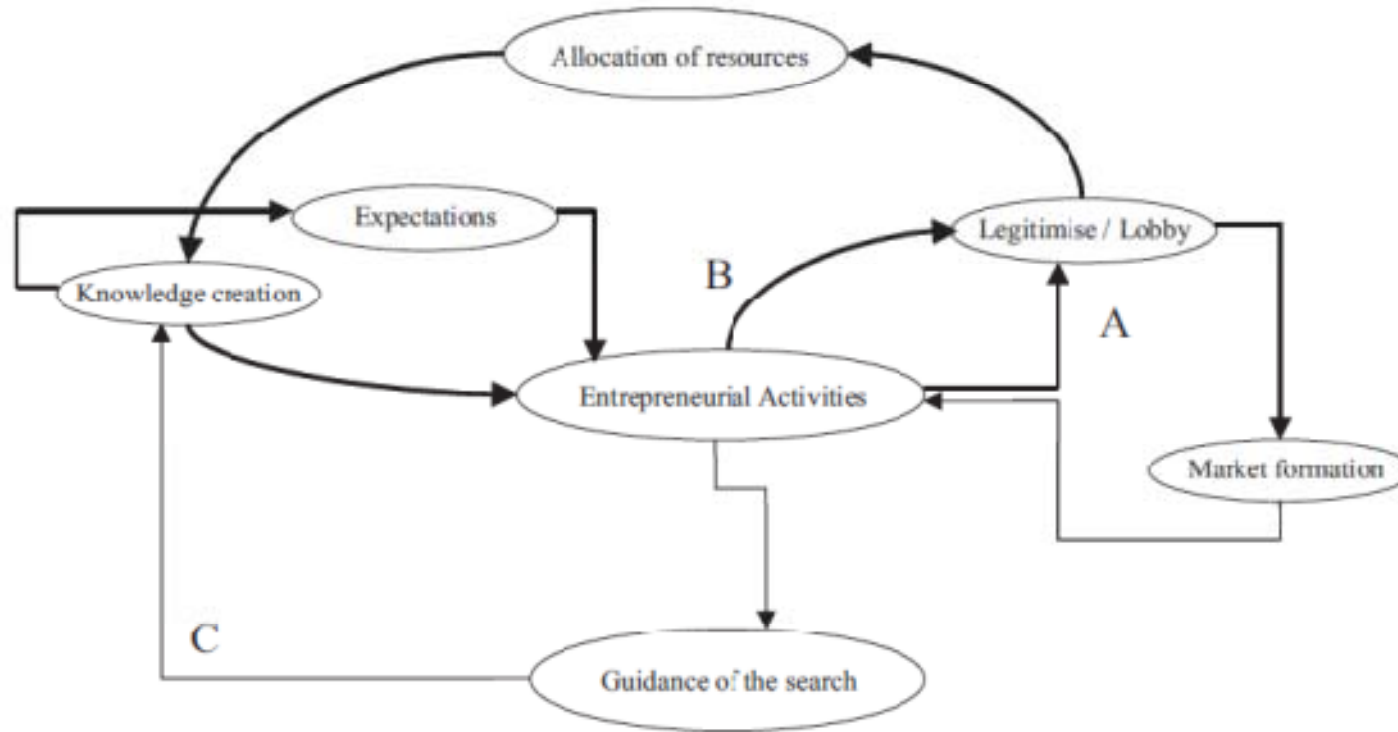
# Functions of Innovation Systems

What are the activities needed for successful development and implementation of a technology

7 'functions':

1. Entrepreneurial activities
2. Knowledge development
3. Knowledge diffusion
4. Guidance of the search
5. Market formation
6. Mobilization of resources
7. Creation of legitimacy

# Feedback loops -> self-sustained growth





# Function 1: Entrepreneurial activities

- incumbents and/or
  - new entrants / startups
- 
- wind power industry in Denmark initiated by startups with new insights
  - PV industry in Japan initiated by incumbent companies with sufficient financial basis

# Function 2: Knowledge development

- learning by searching
  - learning by doing
  - learning by using
- 
- all three are important

## Function 3: Knowledge diffusion

- interactive learning within the same or between different actor categories
- in Danish wind turbine sector very successful interactive learning between wind turbine producers, owners and researchers

# Function 4: Guidance of the search

- laws
  - policy programs
  - already available knowledge base
  - technical 'exemplars'
  - local technical circumstances e.g. the state of the electricity grid
  - local cultural circumstances
  - local political circumstances
- 
- PV industry in Japan large influence on policy programs, plans and targets

# Function 5: Market development

- involving the (foreseen) market already at an early stage
  - possibly through market subsidies
- 
- market subsidies important factor for growth of Danish wind power sector and Germany PV sector

# Function 6: Mobilization of resources

- capital resources
- human resources
- physical resources

# Function 7: Creation of legitimacy

- within the incumbent system in which technology will be implemented—  
e.g. the incumbent energy production system
- lobbying for legitimacy/support/policy measures/subsidies
  
- incumbent systems can be strong barriers (e.g. for new energy technologies in The Netherlands)

# Relevant for setting up innovation systems:

- Create a strong network between research institutes, companies, relevant government bodies and demand side actors
- Facilitate optimal knowledge exchange between these actors – match between knowledge demand and knowledge supply
- Also involve the demand side, already at an early stage (both knowledge demand side and end user market)
- Strive for a clear, supportive and consistent policy context



# Relevant for setting up innovation systems:

- Make available loans and risk capital and a well-educated labour force
- Aim at setting in motion positive feedback loops -> sustained growth