



# **Modes of Innovation and Coordination of Innovation Policy**

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# My background

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- Professor in Economics at Aalborg University and at Science Po in Paris.
- Research on Economics and Management of Knowledge and Innovation for more than 30 years
- Developed the concept 'National Innovation System' together with Christopher Freeman in the 1980s
- Deputy Director 1992-95 at OECD Directorate for Science, Technology and Industry
- 2009 EU-ambassador for the European year of Creativity and innovation



# Today's lecture

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- Why promote innovation?
- On the need for a holistic understanding of the innovation process.
- On the need for a broad definition of the innovation system.
- On the need for new type of coordination of innovation policy.



## Two relevant publications

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- Jensen, M.B., Johnson, B., Lorenz, E., and Lundvall, B.-Å. (2007), 'Forms of knowledge and modes of innovation', *Research Policy*, vol. 36, nr. 5, June.
- Arundel A., Lorenz E., Lundvall, B.-Å. and Valeyre A. (2007), 'How Europe's economies learn: a comparison of work organization and innovation mode for the EU-15', *Industrial and Corporate Change*, vol. 16, no. 6.



# Why promote innovation?

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- Ash and Oil spills call for technological innovation and so does Global Warming – ‘nature strikes back’.
- Underlying the European crisis is uneven development of innovation and industrial transformation 2000-2010 – ‘the real economy strikes back’.
- Innovation is a necessity for long term survival of business and for sustained regional development.



# Principles of Systemic Innovation Policy

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- Inclusiveness: Broad and strategic involvement of users and employees
- Openness: Enhancing the capacity to absorb and use knowledge developed abroad.
- Industrial Transformation: Moving toward more advanced products to reduce exposure to global competition.

This is especially important for small open economies ( and regions!).



## On the need to combine Science-based with Experience-based learning

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- Science becomes increasingly important for innovation in all sectors – also the so-called low-tech sectors
- But most innovations do not come directly out of scientific research – and in order to develop successful innovation there is a need to combine science-based (STI) with experience-based knowledge (DUI)
- Analysis based upon data from 700 Danish private sector firms.



## **STI-mode and DUI-mode of learning**

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- **STI**=Science-Technology-Innovation mode is characterised by science-approach –Innovation policy as 'science-technology policy'.
- **DUI**=Learning by **D**oing, **U**sing and **I**nteracting mode refers to experience-based knowledge – Innovation policy as 'human resource policy'.





## **STI-mode of learning - indicators**

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- Expenditures on R&D as share of total revenue
- Cooperation with knowledge institutions
- Indicator for workforce composition



## **DUI-learning mode**

### ***Indicators***

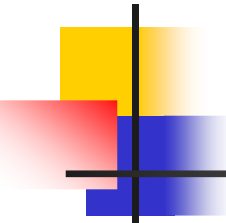
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- Interdisciplinary workgroups
- Quality circles
- Systems for collecting proposals
- Autonomous groups
- Integration of functions
- Softened demarcations
- Cooperation with customers



# Probability to introduce product innovation (corr. for sector, size and ownership)

	<b>DUI/STI</b>	<b>DUI</b>	<b>STI</b>	<b>Low learning</b>
<b>%-share</b>	<b>19.1</b>	<b>26.7</b>	<b>11.7</b>	<b>42.5</b>
<b>Odds ratios</b>	<b>5.064</b>	<b>2.218</b>	<b>2.355</b>	<b>1.000</b>
<b>P-value</b>	<b>&lt;.0001</b>	<b>0.002</b>	<b>.0051</b>	



# On the need to combine science-based with experience-based learning

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- Firms combining *science-based (STI-mode)* with *experience-based (DUI-mode)* learning are more innovative than firms biased toward one mode.
- Implies broad definitions of innovation systems and innovation policy.



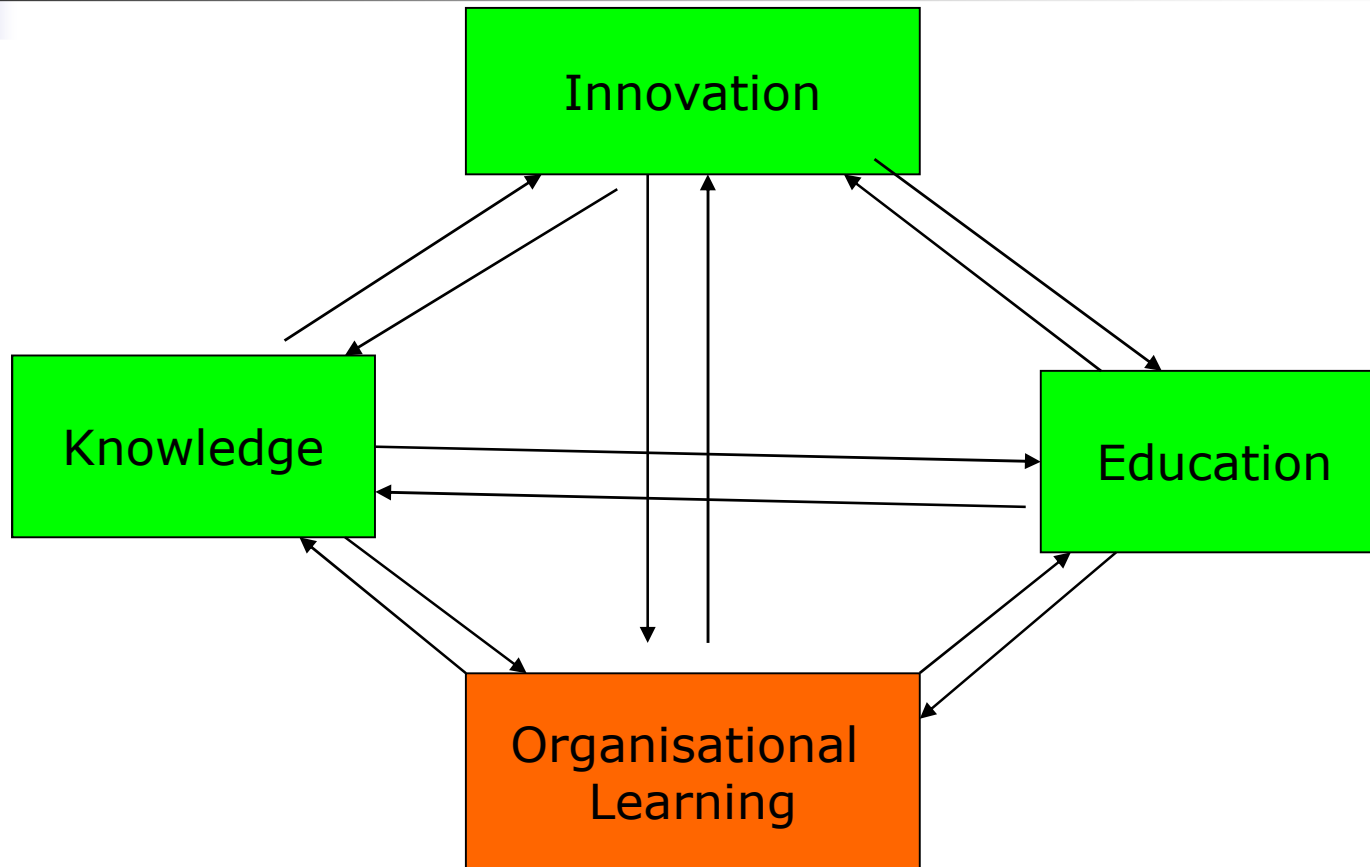
## Innovation is relevant both for Low tech and High tech-sectors

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- Most attention so far to 4. We need to give more attention to 2 and 3.

	Low tech	High tech
DUI-mode	1.	2.
STI-mode	3.	4.

# From the Knowledge Triangle to the Knowledge Rectangle





## Who need a broad definition of innovation system and innovation policy

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Human resources are key to innovation and we need to build strong 'Innovation and Competence Building Systems' that include:

- Labour market institutions
- Industrial relations
- Vocational training
- Educational principles

That support organisational learning and life-long learning

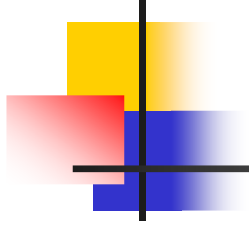


# Who should be in charge of innovation policy?

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- Ministries of education and science tend to focus upon STI-mode of innovation.
- Ministry of industry would be more inclined to take DUI-mode into account
- The ideal construction may be a national/regional 'Council for Innovation and Competence building' under the active leadership of the prime minister/president!





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Thanks for your attention!