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The "trinity" of innovation: The dynamism of materiality, organization and discourse

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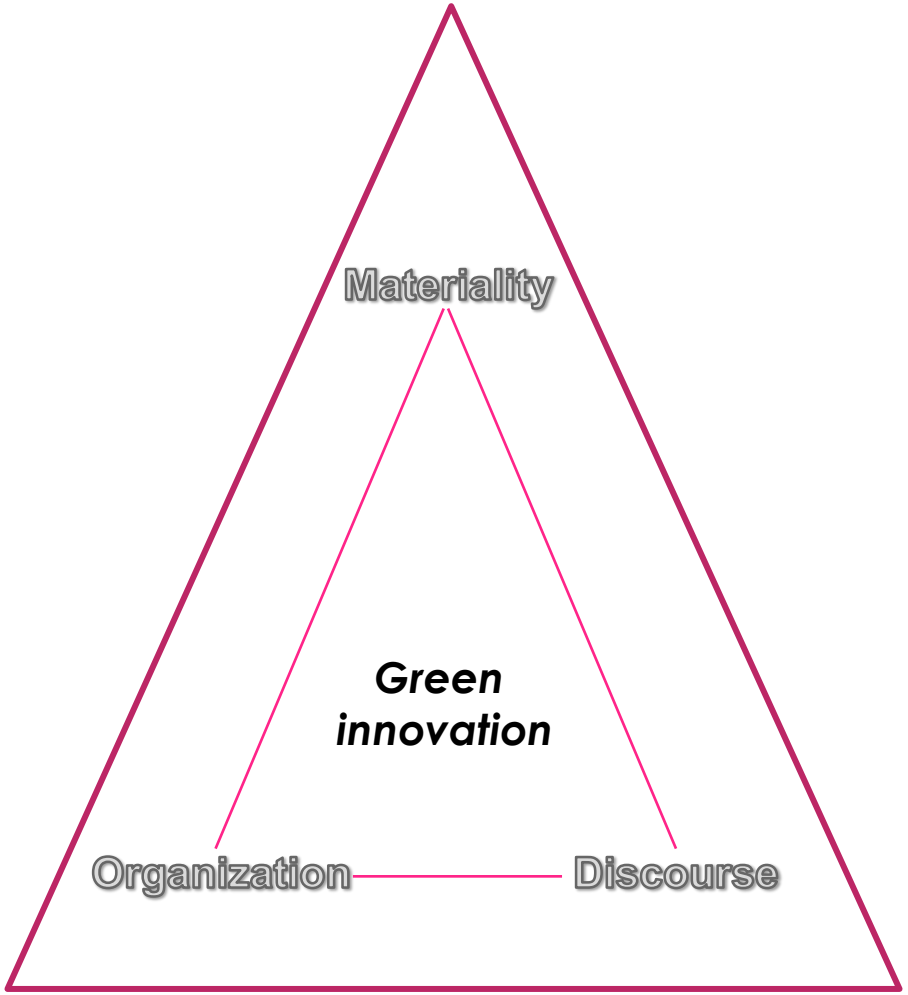
THE "TRINITY" OF INNOVATION

The main consern:

Is it possible to capture the material organizational and discursive character of innovation in one approach?

Case:
The greening of the Norwegian salmon farming industry



THE "TRINITY" OF INNOVATION

Innovation as materiality

- Schumpeter's distinction between invention and innovation linking innovation per se to the capitalist mode of production
- Focus the number of patents, new products or start-ups in a given industry, regions, etc.
- Technology push through R&D and diffusion
- Hägerstrand, *Innovationsförloppet ur korologisk synpunkt* (1953) - vaccination technology preventing tuberculosis in cattle - distance delay in the flow of information
- Ignored the discursive context of innovation

Innovation as organization

- How innovation are organized, develop and change in different settings (Lundvall)
- Innovation studies mowing from a (linear) patent-material-instrumental perspective to a (interactive) organization-network-system perspective (regional innovation systems (Cooke)
- Focus on technology implementation, knowledge, development, networking, modes of innovation
- Should the economic imperative be taken for granted?

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Innovation as discourse

- Through the antiquity up to the 18th century, innovation was loaded with negative values
- During modernity innovation introduced as novelty.
- Innovations linked to new technologies in industrial production such as the steam machine
- Innovations got attention because of their *utilitarian value*, their contribution to progress
- Innovation defined by the economic imperative
- Recently a new discourse on the greening of innovation practice ('triple bottom line')

THE "TRINITY" OF INNOVATION

Need perspectives that acknowledge innovation as a function of interplays between materiality, organization and discourse

- Can the epistemology of Actor Network Theory (Latour) be to any help?
- ANT encourages us to study the world from the view-point of performance, effects of relations, and *actants* as the primary study objective
- An actant = a relational performing phenomenon "something that acts or to which activity is granted by others" (Latour 1996: 373).
- As such, actants by definition have a structuring role on actors and their ideas: a phenomena constructed through and by systems of relations (Latour 1996).
- An innovation complex = *actant* ?

Case example

The challenges of greening the Norwegian salmon farming industry

- We will analyse the **innovation complex of salmon farming as an actant**

  →*capturing the interplay between the material aspect (technology), the organizational aspect (firms etc) and the discursive aspect (ideas, policy)*

Salmon farming in Norway

- Norway is world's largest producer of atlantic salmon (65% of global production in 2010)
- Production capacity doubled since 2005, now producing 1,2 million tonnes per year (2013) (includes atlantic salmon and trout)
- Norway's 3rd largest export industry , first hand value of 4.7 billion EUR, approx. 25 000 jobs (including suppliers)
- Production controlled by governmental imposed license system

Hegemonic technology

- **"Conventional open net pen"** hegemonic technology

- Several negative environmental impacts_
  →e.g. ocean floor waste, spread of diseases medicines, escape of fish, sea lice etc.
  →criticized by consumers and environmental activists

- Pressure for green technology solutions

The case of closed-confinement systems (CCS)

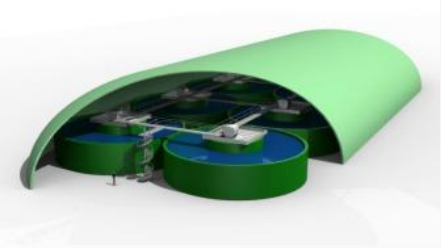
- A new green technology that implies that part of the production (the post smolt phase) is moved into closed or semi-closed production platforms at sea (CCS).
  - Growth of large smolt (1 kg) in floating closed-confinement systems before open net pen stage
  - Controlled production environment when fish is most vunerable
  - The time the fish are in open sea water net pens are reduced from 16-22 month to 10-12 months
- This te…tween farmed fish an…

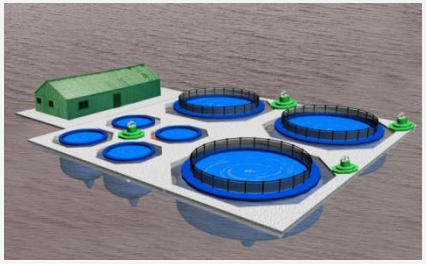
What are the main material, organizational and discursive challenges of implementing this technology ?

Land-based recirculation and reuse system
- Production of «smolt» > 250g
- Fish is grown for x months

Floating, closed-confinement systems with rigid/flexible walls
- Production of «extended smolt» 1000g

Concentional net pen in saltwater
- Adult salmon
- Harvested at 5+ kg
- Xx months





Material challenges

- The development have been dominated by small technology firms with minor funding
- Recently some of the larger fish farming firms and the R&D institutions has got involved in new developmen projects
- Challenges related to production cost (economic efficiency) and technology design (various alternatives)
- One hegemonic solutions (i.e. standardisation, learning) or several competing technology solutions (i.e. rivalry, dynamics)?

Organisational challenges

- Successful implementation of new technology relies on the ability of the firms to overcome organizational path dependency established in conventional production organizations
- Strong interdependencies between technical and organizational innovations(Freeman 1987, Lorenz 2013) → firms needs to develop new modes of organizing in order to implement the new technology
- The bridging of different type of knowledge bases (analytical, syntetic) is needed in order to successfully implement the new technology (new technologies is based on both research based and experienced based knowledge)
- *L*earning within the organization is also crucial as firms and organizations must have organizational capabilities for managing innovation
  - Procedures and routines that enable the organization to transfer individual level learning to the organizational level are important for successful implementation

Discoursive/political challenges

- A policy regime informed by the economical imperative needs to be changed towards a regime that combine economical and environmental tasks
- Technological innovations have been promoted as a mean to achieve environmental task, such as biomass regulations and 'green' licences
- In 2006 Norwegian authorities intended to relax the growth in the Norwegian salmon sector and improve the environmental status by introducing "maximal accepted biomass" as a regulation principle.
- Contrary to the intention, annual total production continued to increase, partly as a consequence of how the fish farmers reorganized their smolt stocking and harvesting methods.

THE "TRINITY" OF INNOVATION

ANT makes it reasonable to define innovation as a complex of *actors* (ways of organizing and disorganizing), *technologies* and *discourses (ideas and policy)*

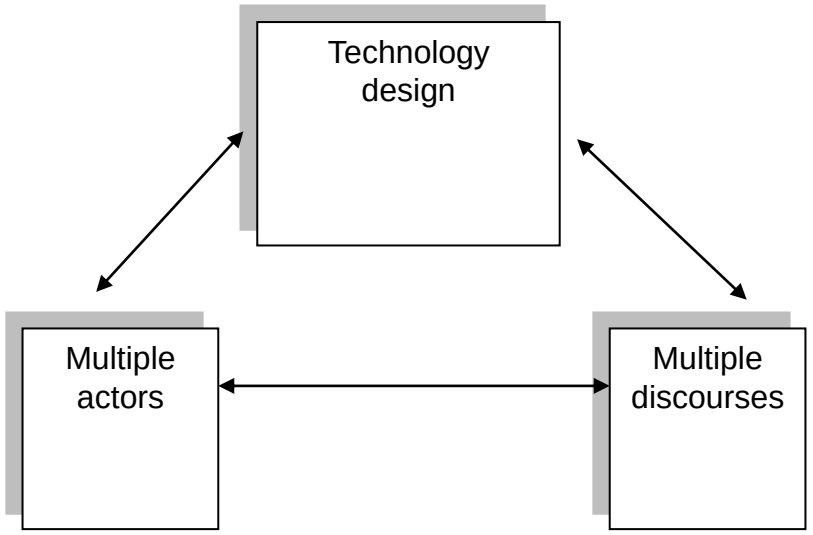


Fig. The innovation complex as an actant

THE "TRINITY" OF INNOVATION

There are innovations in which complexes of *actors–objects–ideas* reflect differing histories, values and interests.

- Traditionally, the innovation of the salmon industry has been dominated by the industry actors and their economic imperative
- However as demonstrated in our case competing ideas/imperatives of other actors such as R&D institutions, regional and national authorities, NGOs, customers etc. should also be considered.
- A policy solution for our case can be the development of '*Green regional niches'*, i.e. coalitions of regional stakeholders that in cooperation with national authorities develop a suitable framework for salmon farming in their region (Cooke 2011)