The SKIN model

Governance of research and innovation networks

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A model that did not work: the linear model of innovation

EU Competitiveness and Innovation Programme 2007-2013:

„The linear model of innovation, that assumes that research leads directly to innovation, has proved to be insufficient to explain innovation performance and to design appropriate innovation policy responses [...]“. Innovation governance and culture should therefore given priority“.
A network model of innovation

Example: biotechPharma

- University
- STI Policy
- Uni. Hospital
- MNC
- DBF
- Testing
- Financing
- Commercialising

Spin-off R&D cooperation
Funding
Licensing R&D alliance
Co-Patenting

Map/Scan
Analyse processes
Simulate
The agent-based SKIN model

http://cress.soc.surrey.ac.uk/SKIN/

SKIN - Simulating Knowledge Dynamics in Innovation Networks

SKIN is an agent-based model to simulate the behaviour of innovation networks in complex social systems.

Learning about innovation processes and networks

Using conceptual models based on robust empirical studies, SKIN is the ideal platform for learning about different processes for creating, transferring and distributing knowledge, collaborating for innovation, models of innovation networks and governance of these processes, collaborations and networks.

Applying ABM to real-world policy contexts

Developed in European studies with case studies in different technological and institutional contexts, SKIN is one of the leading platforms for applying agent-based modelling (ABM) to innovation networks found in a variety of different, real world contexts.

Combining innovation research methods

Add SKIN to the innovation policy-making toolbox. The mix of traditional analytical methods and the powerful SKIN approach, combining robust empirical studies, computational network analysis and ABM, allows for cross-fertilization.
SKIN bibliography 1


Tasks for setting up the simulation model

• Create a theoretically grounded model of the research and innovation system in question
• Do empirical research on the target system
• Implement the agent properties and behaviours discovered in empirical research and suggested by theory
• Calibrate model with empirical data
• Let the model „reproduce“ the current empirical status of the system in question (if possible validation features)
• Use this simulation as baseline scenario for all policy changes (governance, evaluative questions)
3 examples
Innovation Policy Simulation for the Smart Economy (IPSE)

IPSE outlines a framework for research on the needs of the Irish economy to breed an innovation ecosystem with optimally structured university–industry–government networks.

Learn more »
Calibrating the adapted SKIN model: IPSE-SKIN Flow Diagram

1. Calls for Proposals
2. Proposals
3. Research Deliverables
4. General Market Environment

- Irish Government
- Agents FNDs
- Research Deliverables
- Actors’ Kenes
- SEIN Model of Market Competition
- Agents RESs
- Agents RTOs
- Agents INTs
- Agents LDFs
- Agents SMES
- Agents SUPs
- Agents ENTs
- MNCs
- Entry / Exit
- Mobile Entrepreneurs

Flow Diagram:
- Calls for Proposals to Proposals
- Research Deliverables to Actors’ Kenes
- SEIN Model of Market Competition to Acts of Kenes
- Research Networks to Innovation Networks
- Innovation Networks to Tech Transfer Networks
- Tech Transfer Networks to Entrepreneurial Networks

networks take profit

Rewards
tax
fund
submit
do research
distribute
exchange knowledge
go-it-alone

Sponsors
- Eligibility criteria
- International Funding Agencies

EA European Academy
ISSI 2015 Workshop „Forecasting Science“ Petar Ahrweiler
Governance of Responsible Innovation

GREAT - 321480

Science in and for Society SiS.2012.1.1.1-1: Governance Frameworks for Responsible Research and Innovation (RRI)
Agent-based simulation CIP-ICT-PSP (calibrated)

Node colors by communities identified by modularity algorithm
Edge colors by funding instrument (see below)
Evaluative questions for Horizon 2020

1. What if there are no changes?
2. What if there are changes to the thematic areas?
3. What if there are changes to the instruments of funding?
4. What if there are interventions concerning the scope or outreach of funding?
5. What if there are interventions concerning the participation of certain actors in the network (e.g. SMEs)?
INFSO-SKIN flow diagram
If you are interested:


• Final Report
Lessons learnt so far
We were/are too slow!

- IPSE set up as a 5-years research programme, rather than a tender project: long duration prevented the uptake of the results
- Stakeholders took the opportunity for very generic discussions
- No agreement between stakeholders on evaluative questions
- Evaluative questions changed in the middle of the project, because policy was quicker than the project
- (Most of the) Stakeholders lost their jobs or retired in the course of the project
- Limited stakeholder feedback, no interaction between meetings
- UCD changed its management during the project lifetime (no push for innovation themes any longer)
- What about all these pre-implementation benefits? Where is the market/demand?
- Policy modelling is not policy making
Acquiring and satisfying the clients

• **Uptake** of modelling and simulation in the policy process (formation, making, evaluation) is *still in its infancy*

• **What about all these pre-implementation benefits?**

• **Where is the market/demand?**

• For the stakeholders to trust the model (and its results), they needed to
  • understand the mechanisms represented in the model
  • feel that they have had an input into the design of the agent rules and characteristics
  • agree that the baseline simulations of FP7 were sufficiently close to what they observed had actually happened
  • be shown appealing visualisations and plots

• **To be really happy, they wanted ‘recommendations’, not ‘findings’**
The modellers

- Most of the time, modellers deliver their findings and never hear about them again.
- If the findings have been used, and how they have been used, remains the secret of their clients.
- Policy modelling is not policy making.
- Though this might be fine for those, who do not want to provide “policy recommendations” anyway, but just want to develop findings for decision support, it might lead to some general discomfort about opaque impacts.
- Not to see what exactly is done with one’s work, comes close to the assumption that nothing is done with it.
- Open questions: What are the ultimate policy objectives for the European support of R&D? When were the policies being formulated and by whom?
Some preliminary conclusions

- Outline pre-implementation benefits
- Get the prediction stuff right
- Do not over-sell
- Showcase example projects
- Do market research to see what the clients really need
- Do agenda setting with funding programmes to allow policy modelling projects in
- Project organisation is key

- Policy modelling is an area par excellence for co-design
- Validation issues are important: Try to organise a systematic check of simulated policies against empirically implemented policies (impact path)
- Clients should allow modellers to see how policies are actually formulated, implemented, and executed with or without relation to their model
Modelling and simulation supports governance

• Models and simulations are second order constructions of modellers and simulators – but they are explicit and controlled

• Models and simulations can shed light on complex dynamics. They can help to understand them and to identify possible access points for intervention on the micro level of agents

• Pre-implementation benefits of scenario simulation (addressing risky, expensive, time-consuming)

• Experiments can be used to give an indication of the likely effect of a wide variety of planning measures

• Empirical ‘Un-observables’, such as knowledge flows in innovation or learning of agents, can be measured

• What-if questions can be put forward (ex-ante evaluation) – a rare option hardly available in the world of planning otherwise

• Stakeholders can use dynamic maps and scenario modelling as a worksite for their ‘reality constructions’ to learn about emerging structures and system behaviour stemming from micro dynamics on the agent level
THANK YOU!