From technology demonstration to transition experiments

Dr Florian Kern

Science Policy Research Unit (SPRU)

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Overview

1. **From innovation to system transformation**
2. **Three frames of innovation policy**
3. **From demonstration projects to transition experiments**
4. **Conclusions**

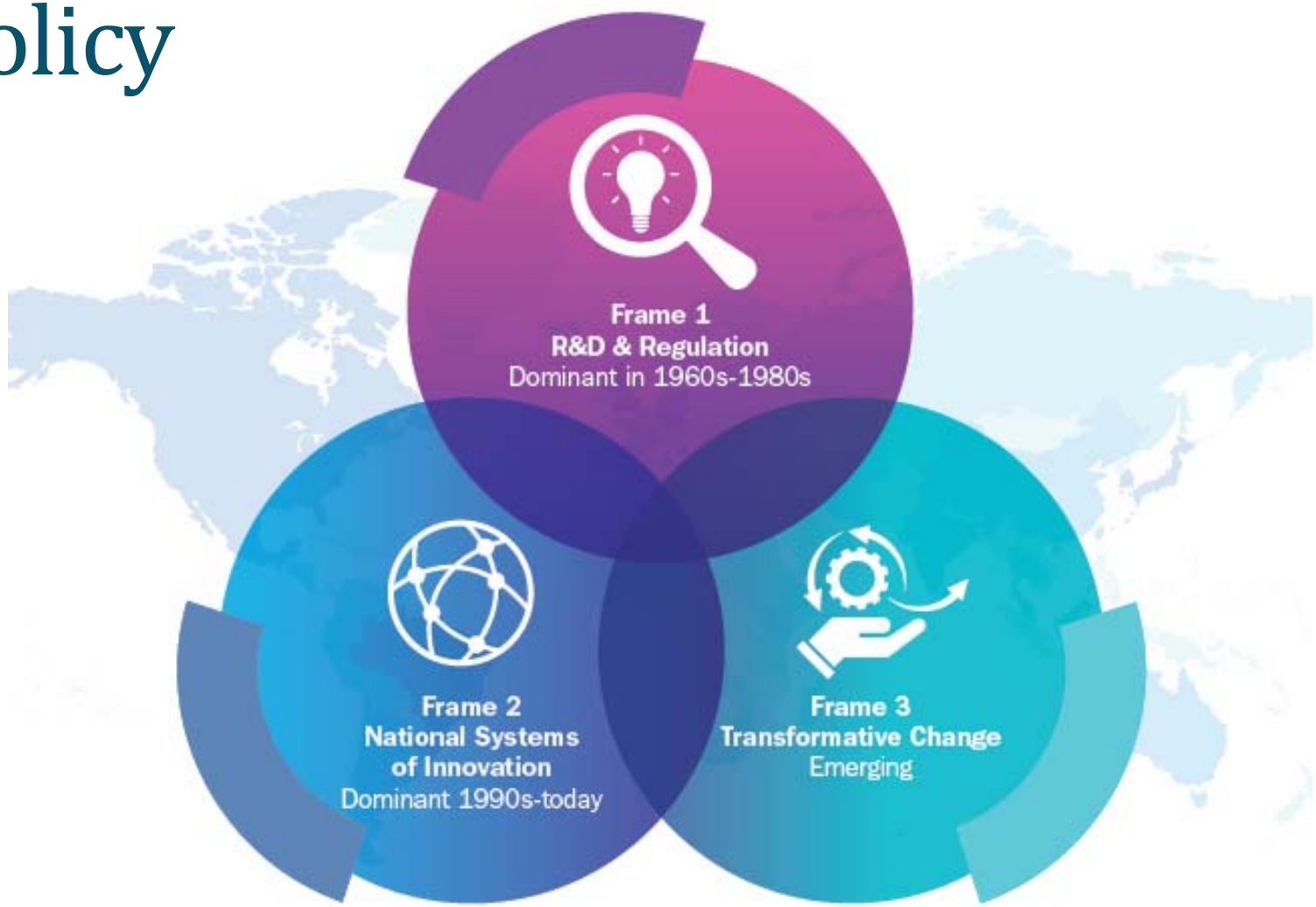
1. From innovation to system innovation

OECD countries are facing a number of persistent challenges: demographic, environmental (esp. climate change), economic (esp. inclusive growth)

‘classic’ innovation policy not sufficiently able to address these challenges (e.g. limited consideration of direction of innovative activities)

→ System transformation is required to overcome persistent problems in existing socio-technical systems: what does this mean for innovation policy?

2. Three Frames of Innovation Policy



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R&D and Regulation Frame

Dominant in 1960s-1980s

Main logic

- R&D produces economic growth (driven by productivity growth) & public welfare & leads to competitive advantage
- Markets leads to externalities (market failures) and need regulation
- Emphasis on uncertainty & long term gains

Role of policy

- R&D support (subsidies, tax credits, procurement, mission oriented programs)
- IPR regime
- Education Policy, with emphasis on Science & Engineering
- Science for Society Communication
- Foresight & Technology Assessment

National Systems of Innovation Frame

Dominant 1990s-today

Main logic

- R&D & learning by using, producing and interacting produces economic growth, public welfare & competitive advantage
- System failure: ‘connecting up the parts’
- Entrepreneurship key
- Markets are institutions; state needs to shape markets

Role of policy

- Kept focus on R&D support, IPR, Education Policy, Foresight, Regulation (Frame 1) but stressed importance of variety
- Spaces for interaction on various levels, for example technology platforms, technology transfer
- Building Regional & National System of Innovation: clusters
- Ability to absorb knowledge, e.g. capability building, skills development
- Programs to stimulate entrepreneurships, incubators

Transformative Change Frame

Currently emerging

Main logic

- Social and environmental needs failure (e.g. inequality and climate change)
- R&D and innovation does not automatically lead to human welfare: need to make distinction between good and bad innovation
- Need for Transformative Change. Regulation is not sufficient

Role of policy

- Generation of More Diversity & Opening up
- Experimentation & Scaling-up
- Foresight, Constructive Technology Assessment & Responsible Research and Innovation (participation)
- Bridge Science/Engineering & Social Sciences and Humanities
- New institutions, coordination between various policies (policy mixes), integrating of STI into other policies

3. From demonstration to transition experiments

Role of experimentation

- Key part of transformative change
- Develop novel socio-technical configurations (e.g. explore regulatory requirements, potential user preferences, new business models, novel partnerships, societal benefits)
- main aim of a transition experiment is not to solve a given (technical or cost) problem but to help create a social learning process across a range of different actors to explore novel socio-technical configurations
- difficult to measure the outcomes of experiments

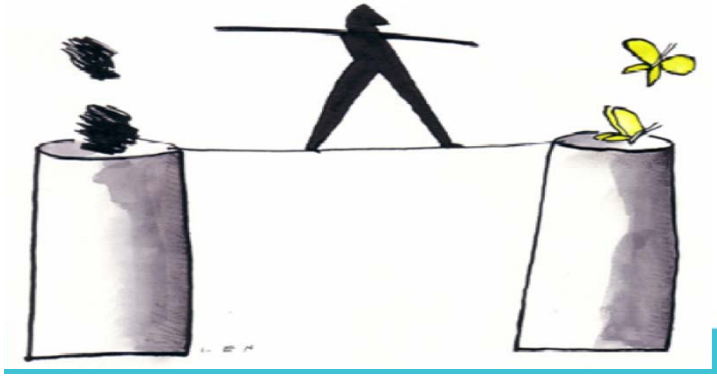
3. From demonstration to transition experiments

	Demonstration project	Transition experiment
Starting point	Possible solution (to make innovation market ready)	Societal challenge (to solve persistent societal problem)
Nature of problem	A priori defined and well-structured	Uncertain and complex
Objective	Identifying satisfactory solution (innovation)	Contributing to a transition (fundamental change in system)
Perspective	Short- and medium-term	Medium- and long-term
Method	Testing and demonstration	Exploring, searching and learning
Learning	1st order, single domain and individual	2nd order (reflexive), multiple domains and collective (social learning)
Actors	Specialised staff (researchers, engineers, professionals, etc)	Multi-actor alliance (across society)
Experiment context	(partly) controlled context	Real-life societal context
Management context	Classic project management	Transition management (focussed on societal transition goals)

3. From demonstration to transition experiments

EXAMPLE: Dutch energy transition programme

- aim: clean, reliable and affordable energy system; reducing carbon emissions by 40-60% by 2030 compared to 1990
- Recognition that traditional demonstration project funding is not suitable for funding transition experiments
- Dedicated funding scheme set up 2004-2007: €118m
- Each project had to involve partnerships, at least one business
- Developed a range of transition pathways for the energy system; experiments were meant to ‘test’ these pathways



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Creative Energy
Energy Transition

3. From demonstration to transition experiments

EXAMPLE: Dutch energy transition programme

Selection criteria

criterion	What are they after?
effectiveness	Potential emission reductions, new business opportunities, or contributing to greater independence of imports
Feasibility and cost effectiveness	technological feasibility and cost effectiveness
strength of demand	is there a sufficiently strong market demand if the project is successful?
pace	can the project be achieved quickly?

3. From demonstration to transition experiments

General lessons

- most commonly reported outcomes: changed discourse and learning, replication of technologies, whereas altered governance structures, new markets and changed consumption practices rare (Kivimaa et al. 2015)
- too focussed on technology development and neglect broader co-evolutionary dynamics
- Often there is too little follow up to generate enough momentum: → Intermediary actors can play a key role in aggregating lessons from individual experiments (Kivimaa 2014)
- regime actors are too dominant in design which limits space to develop radical alternatives (Schot and Geels 2008; Kern and Smith 2008)
- importance of going beyond experimenting: pressure on existing regimes is also crucial for transitions (Kivimaa and Kern 2016)

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4. Conclusions

1. Need for a new frame in innovation policy: innovation policy for transformative change
2. Experimentation is key to exploring novel socio-technical configurations
3. Demonstration projects need to be designed and organised as a form of transition experiment in order to foster learning about potential alternative socio-technical development pathways
4. Appropriate selection and evaluation criteria, mechanisms for aggregating lessons and design independent of incumbent interests are key

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Implementing transitions through multi-stakeholder platforms

University of Sussex