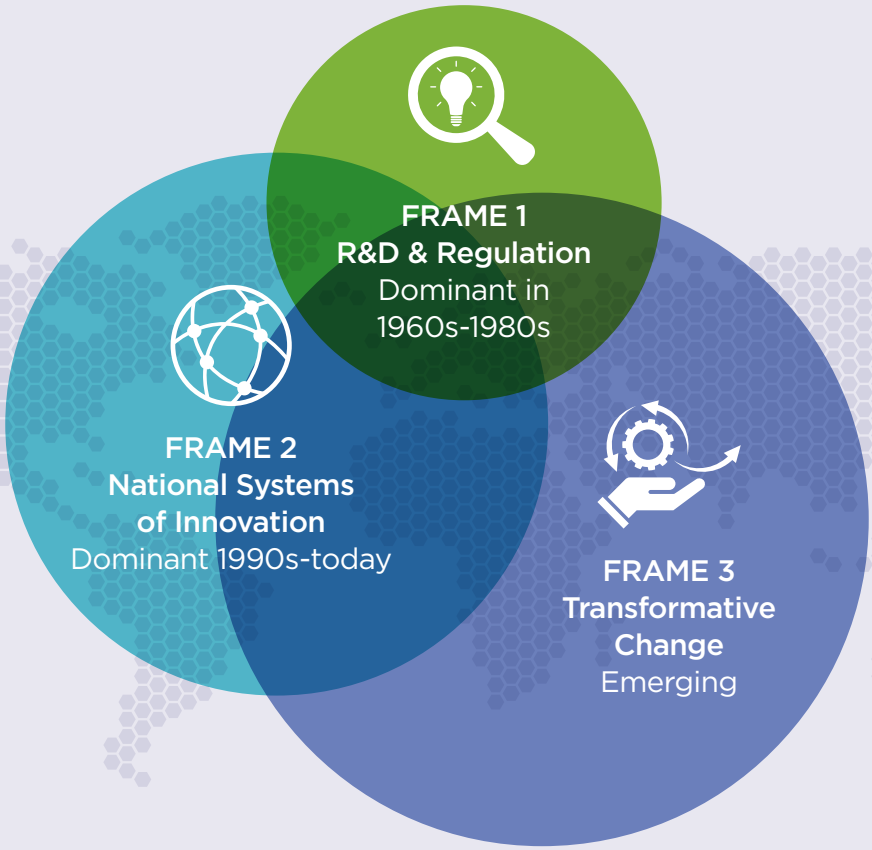

THE THREE FRAMES OF INNOVATION

UNIVERSITY OF SUSSEX | SPRU SCIENCE POLICY RESEARCH UNIT

TRANSFORMATIVE INNOVATION POLICY CONSORTIUM

THREE FRAMES: A COMPARISON

Input provided by: Johan Schot (SPRU), Ed Steinmueller (SPRU), Laur Kanger (SPRU), Tuomo Alasoini (Business Finland)

This table allows you to grasp easily the distinctiveness of each frame.

FRAME 1: R&D	FRAME 2: SYSTEMS (A) AND ENTREPRENEURSHIP (B)	FRAME 3: TRANSFORMATIVE CHANGE
		
TIME OF DOMINANCE		
1960s-1980s	1980s to today	Emerging
MAIN GEOGRAPHICAL FOCUS		
National	National and regional systems of innovation intersecting with sectoral and technological innovation systems (a)/ National with particular attention to “centres of excellence” or “clusters” of innovative activity (b)	Multi-scalar: focus on grand challenges that extend to multiple scales exceeding geographical, sectoral, technological and disciplinary boundaries
FOCAL ACTORS		
Government, scientists and industry actors with a tendency to prioritise large firms	Interlinked configurations of government, science and industry actors with particular attention to the role and missions of universities (a)/ enterprises, markets and the government with a particular focus on New Technology-Based Firms and start-up culture (b)	Government, science, industry, civil society, end-users and non-users (as potentially affected parties and contributors to the innovation processes)

FRAME 1: R&D	FRAME 2: SYSTEMS (A) AND ENTREPRENEURSHIP (B)	FRAME 3: TRANSFORMATIVE CHANGE
		
JUSTIFICATION FOR POLICY INTERVENTION		
Fixing market failures: industries fail to conduct basic scientific research that is not fully appropriable or conduct less of this research than socially desirable	Fixing structural system failures: increase in R&D spending does not automatically lead to high performance in terms of innovative activities	Fixing transformational system failures: R&D, innovation systems and commercialisation do not necessarily lead to solving important social and environmental problems
MAIN STRATEGY		
Knowledge generation: provide support for basic and applied science	Knowledge utilisation: boost absorptive capacity; increase system performance by creating of links between actors and facilitating mutual learning (a)/ promote entrepreneurship and facilitate the creation of markets for innovative goods and services (b)	Solving social and environmental challenges: tilt the regulative playing field on the global level and provide more space for experimentation with niche solutions on the local level, enabling socio-technical systems change
NATURE OF CRITICAL KNOWLEDGE		
Appropriate and transferable: easy to adopt, apply and utilise without protective measures	Sticky and situated: utilisation requires proximity, absorptive capacity and interactive learning	Emergent and co-produced: generated through dialogue between multiple actors as part of a collective search process
FOCAL AREAS		
High technology: stress on the creation of radical novelty	Radical and incremental product and process innovations: stress on significant price/performance improvements through successive incremental innovations	Socio-technical systems: stress on fundamental transformation of system architecture, changing both its components and its directionality of development

FRAME 1: R&D	FRAME 2: SYSTEMS (A) AND ENTREPRENEURSHIP (B)	FRAME 3: TRANSFORMATIVE CHANGE
		

TYPICAL POLICY ACTIVITIES

- R&D stimulation (subsidies, tax credits, procurement, mission-oriented programmes)
- Building the Intellectual Property Rights regime
- Education policy with emphasis on Science, Technology, Engineering and Math (STEM) subjects
- Science communication to explain the importance of STEM to wider public
- Foresight to select focus areas, regulation and technology assessment to manage negative impacts

- Constructing links between actors (building platforms, networks, databases) and organising technology transfer
- Stimulation of learning-by-doing, learning-by-using, learning-by-interacting
- Use of demand stimuli (e.g. procurement) to enhance and accelerate market development
- Building regional and national systems of innovation by assessing capabilities gaps and technological opportunities, implementing policies to address them
- Enhancing skill development based on proactive analysis of skill gaps and shortfalls
- Programs to stimulate entrepreneurship and incubators (including indoctrination in the social value of entrepreneurship)
- Improving business conditions for Small and Medium-Sized Enterprises and start-ups
- Addressing the nature of equity markets (mezzanine level finance, IPO, inclusion in exchanges), especially angel and venture capital markets

- Stimulation of experimentation with niche technologies, scale-up and acceleration of socio-technical transitions (e.g. Strategic Niche Management, innovation intermediaries, Transition Management)
- New institutional solutions for changing the directionality of existing R&D and innovation activities (e.g. technology forcing, Responsible Research and Innovation, policy mixes for stimulating niches and destabilizing existing systems)
- Promoting social, inclusive, frugal and pro-poor innovation
- Bridging science/engineering, social sciences and humanities in the education system

UNDERLYING MODEL OF INNOVATION

Linear model: invention (discovery) leads to innovation (commercialisation) leads to diffusion (adoption)

Interactive and system-bound: chain-linked model stressing feedback loops between invention, innovation and use; evolutionary model, stressing ongoing interactions between actors, networks and institutions (a)/demand-pull model – needs of organisations and individual consumers largely drive innovative activities (b)

Systemic and experimental: quasi-evolutionary model including non-random (purposeful) variation, selection and retention, stress on feedback loops between invention, innovation and use, and ongoing interactions between actors, networks, institutions and technologies

FRAME 1: R&D

FRAME 2: SYSTEMS (A) AND ENTREPRENEURSHIP (B)

FRAME 3: TRANSFORMATIVE CHANGE

BASIC ASSUMPTIONS ABOUT INNOVATION

- Division of labour: clear division of labour – government provides, science discovers, industry applies and consumer adapts; increase in R&D will automatically translate into more innovation
- Conflict vs. consensus: most often embedded in a military-industrial complex that takes defence needs as forerunners and large industries as the "natural" intermediary to translate scientific advances into commercial application; open conflict with new firms and industries that are not part of the club
- Technological and social progress: the link between the two is largely uncontested

- Division of labour: multiple closely interacting actors with different but partially overlapping roles contributing to the overall performance of the system (a)/ clear division of labour – the task of the government is to facilitate the operation of existing markets and to create markets where they do not yet exist; left to themselves markets provide novel products and services at optimum quantity and price (b)
- Conflict vs. consensus: evolutionary in rhetoric but functionalist in practice, emphasis on cooperation between various actors, leading to the fulfilment of system functions (a)/ tends to be conflict-oriented, mainly stressing international competitiveness of states and competition between enterprises (b)
- Technological and social progress: the link between the two is largely uncontested

- Division of labour: blurred boundaries, multiple actors crossing various domains and enacting overlapping roles, resulting in the co-production of science, technology and society
- Conflict vs. consensus: mix of competition and cooperation is required to achieve disruptive socio-technical systems change
- Technological and social progress: non-neutrality of technology, specific technological designs and the directionality of innovative activities might serve to create, solidify or amplify environmental and social problems

BASIC ASSUMPTIONS ABOUT OUTCOMES

- Dealing with consequences: new technologies are associated with high degree of uncertainty and unpredictability making it virtually impossible to address major environmental and social impacts proactively
- Causality: stress on innovation as a motor of economic growth leads to public welfare as a bonus

- Dealing with consequences: largely reactive, major environmental and social impacts are usually addressed after they have occurred, sometimes with a particular emphasis on the provision of adequate market stimuli (b)
- Causality: stress on innovation as a motor of economic growth and increased competitiveness leads to public welfare as a bonus

- Dealing with consequences: proactive, stress on anticipating alternative futures associated with certain technological choices
- Causality: stress on innovation as means for directly addressing environmental and social challenges leads to economic growth and increased competitiveness as a bonus

FRAME 1: R&D

FRAME 2: SYSTEMS (A) AND ENTREPRENEURSHIP (B)

FRAME 3: TRANSFORMATIVE CHANGE

MAIN HAZARDS

- Government failure: insufficient funding for basic R&D
- Market failure: negative externalities that require regulation

- System failure: innovation system fails to perform as a synergistic whole and to enhance innovative activities (a)
- Government failure: too many state restrictions on business activities (b)
- Market failure: regulatory need to deal with negative externalities in a way that would not stifle entrepreneurship (b)

- Transformative failure: failure to induce fundamental transformation to socio-technical systems forming the backbone of modern societies
- Societal and environmental needs failure: failure to solve extra-economic and collective problems on multiple scales

PARALLEL COUNTER-NARRATIVES

- Appropriate Technology movement, focus on small-scale solutions

- Politics and democratisation of Science and Technology
- Inclusive and interactive

- Technological fix: strong state intervention with massive investment in Big Technologies which promise to solve large social and economic issues

UNIVERSITY OF SUSSEX

SPRU
SCIENCE POLICY
RESEARCH UNIT

This course was developed and delivered by faculty
from the Science Policy Research Unit at the University of Sussex