EUROPEAN POLICYBRIEF

Innovation futures in Europe:
A foresight exercise on emerging patterns of innovation. Visions, scenarios and implications for policy and practice

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INTRODUCTION

New forms of innovation are emerging in economy and society

The way we organise innovation is changing. One hundred years ago the Austrian economist Joseph Schumpeter has seen the entrepreneur and the development lab as prime locus of innovation. However, today innovation is seen as something which can happen anywhere by anyone at anytime. Emerging innovation models such as open innovation, user innovation or community innovation describe this development stressing that innovation is increasingly perceived as an open, distributed and networked phenomenon.

Will the increasing involvement of different actors such as customers, citizens, research institutes and public organisations hold on in the future? Can the pace of innovation in a global innovation landscape be maintained in the long run? How does this affect people, communities, employees and companies?

While new forms of innovation have been discussed intensively in recent years, there is little systematic exploration about their potential for different sectors and areas and its implications for economy and society. With the INFU project for the first time a foresight project analyses and discusses the emergence and diffusion of new innovation patterns and their significance for European policy.

Policy needs evolve alongside new forms of innovation

The project combined various foresight methods such as weak signal scanning, scenario development and assessment. A core task was to develop and assess visions and scenarios concerning possible futures of the European innovation landscape. The final phase of the project focussed on assessing these visions and scenarios and drawing conclusions for European policy. This final policy brief presents the results of these efforts.

SOCIO-ECONOMIC SCIENCES AND HUMANITIES RESEARCH

KEY OBSERVATIONS

Eight dimensions of change describe the way how innovation is organised in the future

In this report we draw conclusions for policy based on the previous INFU work packages. This is done by discussing and assessing eight dimensions of change in innovation patterns. The dimensions of change aim to describe those key characteristics which are common to most of the emerging innovation models and visions we have synthesised within the INFU project and presented in the previous policy briefs.

Development of policy conclusion in co-operation with experts involved in workshops and interviews

In the following paragraphs we briefly describe challenges and implications for policy for each dimension of change that were developed together with more than 50 experts in the course of three workshops and a number of interviews.

The development of policy conclusions was guided by the idea that policy should exploit and unfold opportunities of new innovation models on the one hand, and avoid risks and possible negative impacts on the other.

The following dimensions of change in innovation patterns emerged as common features across the many different changes in ways of organising innovation observed in the INFU project:

Dimension 1: Mediation and coordination

The **position of markets as the main mediator** between innovation demand and supply **is challenged** by several new innovation patterns. Other coordination mechanisms such as **self-organised communities** or **web-based co-design platforms** are on the rise.

In order to strengthen innovation capability **policy should take a leading role as a facilitator of the newly emerging non-market based collective innovation activities**. This however requires a number of policy innovations. Self organised networks of innovating individuals will have to be considered as relevant target group for innovation policy measures. Projects with new formats will be required that involve diverse actors from many realms in joint learning processes. These measures will have to be coordinated across diverse policy realms and bridge across public and private sector initiatives.

In addition, policy needs to help establish clear and transparent rules for these types of new innovation formats. In particular rules and norms regulating the ownership of innovation, product liability and fair distribution of benefits need to be developed.

Dimension 2: Participation

Citizens and customers play a more relevant role in innovation, both in deciding on innovation priorities and in contributing to the innovation process. Finding the right level and instruments to enable this kind of co-creation of solutions seems a crucial future challenge.

Policy may need to focus on the enabling framework for the four pillars of the innovation system (quadruple helix): the co-evolution of **government, knowledge institutions, industry, and civil society**. This implies a change in the role of policy-makers towards mediators within a wide range of coordination processes.

Finding the right level, scale and instruments to **enable participatory co-creation of solutions seems a crucial future policy challenge**. Adequate consultation processes where people are motivated to contribute must be developed. Participatory procedures that fit today's modes of group interaction such as web 2.0 procedures should be developed, tested and deployed. Normative and exploratory forward-looking activities where actors jointly develop shared visions, debate values and possible pathways and solutions could become a standard policy instrument. Such processes may be key in avoiding the risk of a "participation-induced" lock-in into today's situation due to lack of long-term orientation on the part of today's actors.

Dimension 3: Motivation

The motivation for innovation is changing. Company profit as the main driver of innovation activity is being complemented. **Solving societal problems is becoming an important driving force** to innovate, for both companies and individuals. In addition, individual actors are motivated to contribute to innovation activities such as crowdsourcing initiatives or idea competitions for their pleasure.

The expanded circle of stakeholders and participants in innovation processes through new motivations to innovate (e.g. value-driven or even "fun-driven") demands new coordination mechanisms, often based on participatory processes and user involvement. This also leads to the need for policy innovation and coordination, aiming to include different sector policies, together with innovation policy matters.

In addition, the direction of innovation development should be guided (giving orientation) by demand-side innovation policies such as i) public procurement, ii) objective-driven innovation policies, and iii) increased labelling and giving meaning to products and innovations.

Policy for **social innovation and social entrepreneurship** should be strengthened, too. Such companies have proved to be "profitable" in monetary and non-monetary terms.

When innovation activities are no longer primarily directed at money-making, the current Intellectual Property Rights (IPR) system no longer fits the innovation landscape and hinders the transition towards co-designing landscapes that enable new forms of innovations. However, new strategies such as **public domain, copyleft and creative commons** help to transform the IPR systems and provide a safe base for experimentation.

Dimension 4: Automatisation

Software will play an ever-growing role in innovation. More and more innovation steps may become automatised, e.g. by using a web crawler to identify ideas.

Policy measures should reinforce the use of powerful algorithms for more accurate assessment of complex systems, supported by open availability of data. Simulation-based ex-ante evaluation of policy measures with respect to environmental and societal impact could be a positive effect of automatised innovation processes. However, policy should be very aware of the **risks of an increased automatisation** of innovation and possible unintended long-term effects on creativity.

Concerning the use of information and communication technologies to run (parts) of the innovation process, ex-ante principles could guide the use of digital data for such innovation purposes and, at the same time, after relevant evidence has been collected, could lead to (ex-post) legislation and regulation without over-protecting and hindering automatised innovation. Such stringent principles, for example, could guide the protection of intellectual property, user rights and transparency of the data as well as the (fair) share of profit and value created with the data. Content policy, interoperability and standardisation issues to prevent monopolisation of data processing and storage should become issues of ever growing importance.

Dimension 5: Infrastructures

New innovation enabling infrastructures emerge alongside new innovation formats. In particular **enabling infrastructures for community innovation**, such as innovation camps, shared fab-labs and co-working spaces are likely to become more important. In addition, virtual/digital global innovation infrastructures may be increasingly required.

Policy should support the setting-up of such infrastructures (meeting places, living-labs, fab-labs, innocamps, etc.) with **low entry barriers** for people from all kinds of backgrounds and thereby enable widespread smart-bricolage and self-production beyond the "creative class". Pilot projects could be funded within existing innovation funding schemes, but also new more experimental types of projects involving not only companies and researchers, but also civil society actors would be required. Micro-grants and tax breaks could be used to support people who want to organise such camps, fab-labs and other innovation infrastructure projects.

Dimension 6: Perception of creativity

The very **meaning of being innovative is shifting**. Creativity may become a key aspect in all professional activities. Formation of identities and social relations as well as everyday creativity may increasingly be recognised as core aspects of innovation.

In order to avoid stifling creativity, the emphasis of policy measures should be on **appreciating creativity of all sorts, instead of enforcing specific types of ideas within a narrow framework**. An approach is required which allows people to be creative in different roles and to build a bridge between professional and personal life. Regulation and administration should support creativity, both in the workplace and in everyday life. Europe should exploit its strength in

process innovation through putting diverse project teams in place, and giving them an open space and a mandate for strategic innovation.

Dimension 7: Spatial shifts

Innovation will change its spatial patterns. Local elements are likely to gain relevance, resulting in **a more distributed innovation scenery**. At the same time, new regions emerge as key actors in global innovation chains.

Two types of policies are needed regarding the regional shifts of innovation. Firstly, policies are needed which **support globally acting companies to pursue new types of strategy**. For instance, European companies can choose **reverse innovation strategies**, split the design and production of low cost products and sell them worldwide. In addition, company may tailor their products to the requirements of these local contexts and emerging markets. Thus, policy should reduce barriers so that European companies can expand their R&D activities overseas and enable them to conduct global collaboration arrangements.

Secondly, due to the growing importance of innovation which emerge on the regional and city level, i.e. regionalisation of innovation activities, European RTI policy should support regional demonstration projects. However, it is not just about **enabling and supporting (large-scale) demonstration and testing initiatives**, but also to make sure that the results of such projects are transferable to other regions and markets, also outside the European Union. Policy should therefore support the development of services and measures that make such transfers possible and enhance the return of these investments.

Dimension 8: Systemic sustainability innovation

Innovation patterns fostering system **transitions towards sustainability rather than isolated product development** become more and more important in order to address the grand challenges. This requires, for example, that social and ecological criteria are considered during the entire innovation process, e.g. by designing circular resource flows (cradle-to-cradle).

If we are serious about addressing the "**grand challenges**", policy needs to support **socio-technical system transitions**. We need to break away from lock-in in non-sustainable socio-technical paradigms and underpin industrial transformation. This requires more than just a shift in priorities that is already underway in many strategies, such as EU2020.

Fostering systemic innovations is challenging for policy as it goes beyond just promoting individual "intelligent" projects, but it requires to adopting a really systemic view (comprehensive impact assessments, long-term strategy perspective, coordination of projects, existence of a system integrator, etc.). To obtain successful system transition insights into society, lifestyle values and culture are as important as technological knowledge. Barriers and enablers rooted in social patterns need to be as well understood as technological challenges.

To explore successful transition trajectories, we need to **integrate perspectives from engineering and natural science**, on the one hand, and **humanities and social sciences** on the other. To this end, research projects with this kind of trans-disciplinary collaboration on an equal footing should be explicitly supported. Furthermore, in order to understand and promote the societal benefit of new technological solutions, it will be necessary to extend RTI funding beyond the early stages of research towards the exploration of their societal embedding.

In addition, sustainability transitions require further development and application of systemic indicators for sustainability innovation.

RECOMMENDATIONS FOR POLICY-MAKERS

From the findings of the INFU project we can summarise the following twelve challenges for policy-making:

1.	**Establish rules for new forms of coordination and mediation**	A new regulatory framework for the new types of distributed innovation needs to be put in place, e.g. IPR and for the distribution of profits between organisations and individuals. In addition, new strategies such as public domain, copyleft and creative commons enable new forms of innovation which at the same time do not crowd out motivation.
2.	**Enable participation**	Build up competencies for a participatory society, develop tailored procedures for different types of interaction of actors from academia, industry, policy and civil society (quadruple helix). Define adequate levels and scales of participation for each phase of decision-making. This implies a change in the role of policy-makers towards mediators. In addition, when individuals (e.g. citizens, users, laymen) or groups of individuals organise themselves, new target groups come into focus for RTI policy.
3.	**Strengthen policy for social enterprises**	Raise awareness of the relevance of social innovation which often create new markets for services as well. Understand the requirements of social innovation and develop adequate support mechanisms.
4.	**Define and use new indicators for innovation**	Distinguish the effects of innovation on society and effects on growth. Measure quality (e.g. well-being and quality of life) instead of quantity to define the success of innovation policy.
5.	**Support value-driven innovation**	Motivate innovation around grand challenges. Support innovation for its outcome, not for its own sake. Apply holistic measures for the global benefits of innovation. Explore the use of modelling and simulation of innovation effects. In addition, the direction of development of innovation should be guided by demand-side innovation policies, such as public procurement and increased labelling and giving meaning to products and innovations.
6.	**Enable smart 'GLocalisation'**	Foster localisation without localism. Unlock regional lead markets for global solutions. Support regions in the tailored transfer of their joint solutions. Support dialogue among regions and cities and exploiting thus knowledge spill-overs. Raise awareness for and build competence for low-tech solutions for global needs. At the same time, innovation policy should reduce barriers for European companies to expand their R&D activities in third countries and help to deepen scientific and technological cooperation and transfer of technology.
7.	**Enable everyday creativity**	Foster creativity and playful experimentation from early on. Develop the skills for prospering in today's complex society instead of formal qualifications only. Avoid the creativity divide. Underpin "active jobs" and creative working culture.

8. Foster transformative system innovation	Foster system-oriented research, development and innovation projects e.g. through involving mandatory system integrators. Integrate technical and social science and humanities research and innovation and weight them equally. Involve stakeholders and enable large scale socio-technical experimentation.
9. Foster policy coordination	Coordinate policies across DGs (European level) and Ministries (national level) concerned with innovation, but also towards different policy realms such as education, health, social and cultural policy, in order to reach out to social innovation and achieve socio-technical innovation.
10. Create innovation link chains	Focus on links in the innovation chains leading from research to innovation, including societal embedding and investments in intangibles instead of at looking at R&D in isolation. Assess projects by their system fit and enhance the capacity to innovate.
11. Use software intelligently	Software will play an ever-growing role in innovation. More and more innovation steps may become automatised, e.g. by using web crawlers to identify ideas, but also by using simulation algorithms to generate ideas and to assess market potentials. Policy is asked to seek a balance between enabling faster and efficient innovation processes based on software algorithms on the one hand, and to ensure data security and transparency on the other.
12. Build up new forms of innovation infrastructure	Install infrastructure such as fab-labs and innovation camps with a low entry barrier to enable collective innovation and smart bricolage for all actors and in particular civil society. Make use of the possibilities of modern ICTs and methods to enable participation.

RESEARCH PARAMETERS

Objectives of the research

While there is much research investigating specific forms of innovation such as open innovation, user-driven innovation, community innovation or social innovation there has been little systematic exploration of possible future innovation landscapes and their implications.

INFU explores new patterns and structures of innovation, their potential for different sectors and its implications for economy and society. An analysis and assessment of different innovation patterns allows the design of policies and measures in order to benefit from the potential challenges arising from these changes.

In order to address these needs, the INFU project pursues the following objectives:

- scanning of signals indicating changing innovation patterns with a potentially disruptive impact for European S&T in the long run,
- systematic exploration of relevant and plausible future innovation landscapes through participative scenario building,
- assessment of scenario implications for the content of academic and industrial research, and key policy goals such as sustainability,
- deriving strategic options and guidelines for European research policy and relevant multipliers,
- initiation of an interdisciplinary, boundary-spanning stakeholder and expert debate on new innovation patterns.

Methodology

The project combines various foresight methods such as weak signal scanning, expert panels, scenario development, and scenario assessment and builds on the existing academic literature on new innovation patterns.

The INFU dialogue started by identifying emerging signals of change in current innovation patterns and then progresses by increasingly integrating diverse perspectives and knowledge sources towards consolidated innovation futures scripts. These bottom-up visions were then confronted with different possible socio-economic framework conditions and global mega-trends to finally synthesize consistent scenarios which integrate micro, meso and macro elements of possible innovation futures with particular emphasis on changes in the nature and content of research. Finally, policy strategy options were developed to prepare for the identified changes in innovation patterns.

PROJECT IDENTITY

Coordinator	Karl-Heinz Leitner, Austrian Institute of Technology, Austria
Consortium	Philine Warnke, Fraunhofer Institute for Systems and Innovation Research, Germany
	Francois Jegou, Strategic Design Scenarios, Belgium
	Karl-Heinz Steinmüller, Z_punkt The Foresight Company, Germany
European Commission	Perla Srour-Gandon and Domenico Rossetti di Valdalbero DG Research, Unit L.2
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Related websites	www.thefutureofinnovation.org www.openinnovation.eu www.innovationwatch.com www.researchoninnovation.org www.iknowfutures.eu
For more information	Email: karl-heinz.leitner@ait.ac.at

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