Innovation Futures:
A Foresight Exercise on Emerging Patterns of Innovation
Visions, Scenarios and Implications for Policy and Practice

INFU

Final Report

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Innovation Futures: A Foresight Exercise on Emerging Patterns of Innovation. Visions, Scenarios and Implications for Policy and Practice

FINAL REPORT

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Authors:

Karl-Heinz Leitner[1], Francois Jegou[2], Philine Warnke[3], Johannes Mahn[4], Karl-Heinz Steinmüller[5], Wolfram, Rhomberg[6], Sivert von Salvern[7], Elna Schirrmeister[8], Vanessa Watkins[9]

Consortium partners:

Austrian Institute of Technology (Austria)

Fraunhofer Institute for Systems and Innovation Research (Germany)

Strategic Design Scenarios (Belgium)

Z_punkt The Foresight Company (Germany)

Project Coordinator:

Karl-Heinz Leitner, Austrian Institute of Technology

[1] *Austrian Institute of Technology, karl-heinz.leitner@ait.ac.at*
[2] *Strategic Design Scenarios, f.jegou@gmail.com*
[3] *Fraunhofer ISI, philine.warnke@isi.fraunhofer.de*
[4] *Z_punkt The Foresight Company, mahn@z-punkt.de*
[5] *Z_punkt The Foresight Company, steinmueller@z-punkt.de*
[6] *Austrian Institute of Technology, wolfram.rhomberg@ait.ac.at*
[7] *Z_punkt The Foresight Company, saldern@z-punkt.de*
[8] *Fraunhofer ISI, elna.schirrmeister@isi.fraunhofer.de*
[9] *Z_punkt The Foresight Company, watkins@z-punkt.de*

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DEMAND SPOKED INNOVATION
DELIBERATIVE INNOVATION

1 / Introduction

There are a number of indications that the way economic actors interact in order to transform knowledge into new products and services is currently undergoing substantial changes. While a few radical visions have been taking up these signals and are predicting disruptive change for the economy and society, there is little systematic exploration of possible future innovation landscapes and their implications for economy and society. However, in order for research and other policies to be prepared for the challenges arising from these changes and to be able to benefit from them, a more solid understanding of possible innovation futures and their implications for society is needed. At the same time, there is a need for a debate among innovation actors from various perspectives to create awareness, shared visions, and the momentum for change.

The INFU project addresses newly emerging innovation patterns. Several new ways of organising innovation activities such as "open innovation" or "community innovation" are currently emerging in economy and society. While these have been discussed intensively in recent years, there is little systematic exploration of their potential for different sectors and areas and the implications for economy and society. For the first time, a foresight project has been conducted to analyse and discuss the emergence and diffusion of new innovation patterns and their implications for European policy.

In the last few years, new innovation patterns have begun to generate a great deal of discussion. For instance, in spring 2009, the International Society of Professional Innovation Management (ISPIM) organised its annual conference in Vienna under the key topic of "The Future of Innovation"[1]. More recently, the 2011 Innovation Convention held in Brussels discussed a number of topics around the question of how changing innovation patterns may impact the European innovation landscape[2].

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1 *See for more details: http://conference.ispim.org/*

2 *See for more details: http://ec.europa.eu/research/innovation-union/ic2011/index_en.cfm*

An innovation pattern is here defined as an underlying principle of how the innovation process is organised, including new perceptions about innovation, the involvement of new actors, and the generation of new interpretations in society. The INFU research team thus has a broad understanding of innovation as encompassing the economic, social, and public domains. We are interested in how the process of the creation, development, and introduction of innovations is changing. That is, we concentrate on the process of "innovating innovation".

The INFU project is a foresight project employing various methods such as scanning signals, organising expert panels, conducting interviews, and building and visualising scenarios in order to construct plausible, relevant long-term scenarios of future innovation landscapes. Foresight activities emphasize the systematic exploration of future dynamics and the importance of interaction between actors from different constituencies in the respective innovation system. Foresight is a method of prospective analysis and informed decision-making that includes long- to mid-term considerations of likely, possible, or even just conceivable futures (Miles, 2008). Foresight hence does not want to prescribe the future, but aims to initiate a critical debate about possible future developments.[3]

The main research questions of the project were:

- What are the most likely patterns for how innovation will be organised in the future?
- What are the implications of new innovation patterns for the economy, society, and the environment?
- How do major socio-economic factors such as demographic changes, environmental threats, and urbanisation affect the likely development of the European innovation landscape?
- What are the implications for frameworks conditions (such as Intellectual Property Rights)?
- How could policy makers, interest groups, and companies exploit the potential and reduce the risk associated with new innovation patterns?

The INFU project conducted the following tasks in order to address these questions:

The INFU project started by identifying emerging signals of change in current innovation patterns. These signals were identified through a review of academic literature on innovation and by scanning various media such as newspapers,

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3 *Foresight exercises have been organized by organizations, interest groups, and policy makers on the regional, national or supranational level and become increasingly popular in the last three decades. A recent monitoring study, for instance, has collected 6,000 foresight projects which have been conducted in Europe since 1980 (EC 2008). A wide range of methods already exists which are often combined in different ways for a specific foresight project. Most commonly employed techniques are expert panels, road-mapping, Delphi studies, scenario writing, back-casting, literature reviews, bibliometric searches, modelling, and simulation.*

magazines and the Internet. The aim was to identify newly emerging apparent and visible innovation patterns that have not yet reached the mainstream and may have disruptive impacts for industry, the economy, and society in the future. The resulting collection of 'signals of change' are innovative examples of how private and public organisations organise and manage innovation in Europe and around the globe.

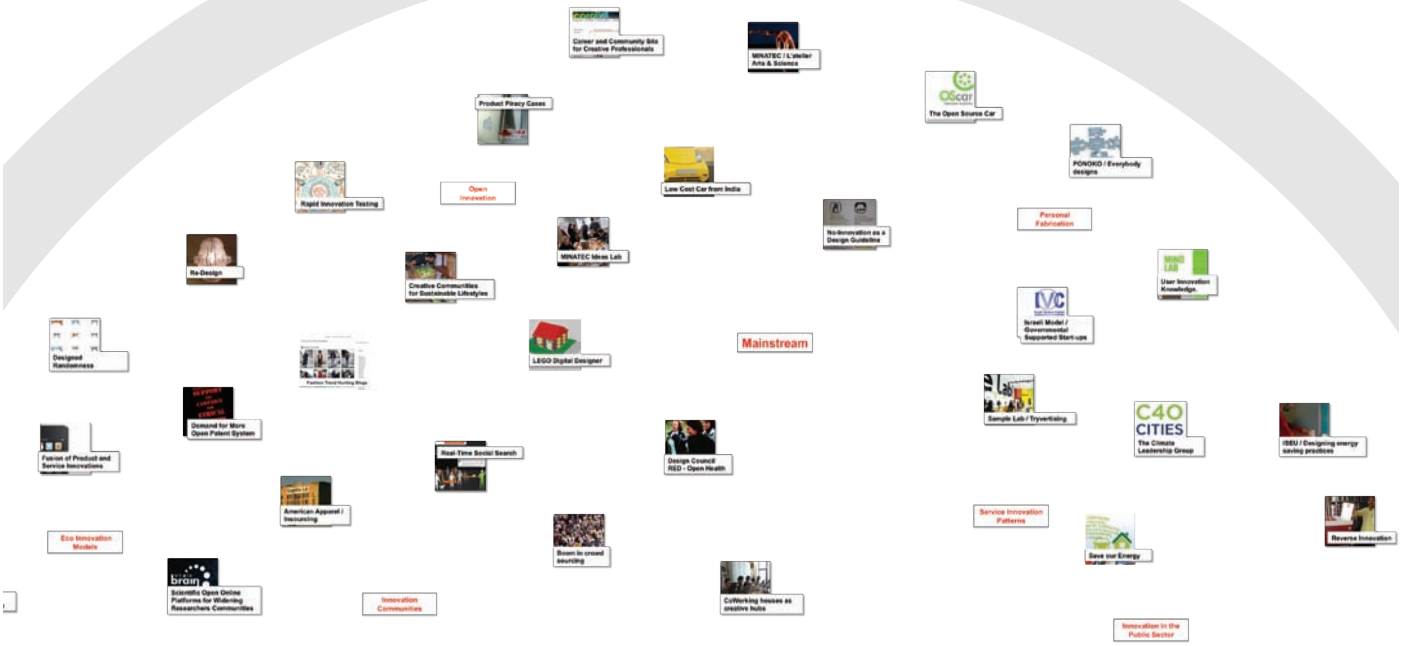
Based on our collection of 'signals of change', we developed 20 visions of new innovation patterns ("innovation visions"). Each vision describes how one or several similar signals could indicate a change in the process of creating, developing, and disseminating innovations in the future. These visions were derived from the signals by means of "signal amplification". This was a creative process, often involving the combination of multiple signals to develop coherent and sometimes provocative pictures of possible future innovation practices. Thereby, the team transferred an idea already applied to other sectors or generalized a signal considered to become a mainstream innovation practice. To provoke discussion, some visions were brought to an extreme. In addition, the team conducted interviews with experts from industry and academia and organised an online-survey to discuss and assess the innovation visions.

On the base of the assessments, eight consolidated visions ("nodes of change"), which are clusters of similar visions, were elaborated in mini-panels by self-organised expert groups. Experts and stakeholders across Europe were gathered in small focus groups to create visions of future innovation patterns around these critical aspects of change and debate relevant drivers and barriers of these visions (see also map for the location of panels).

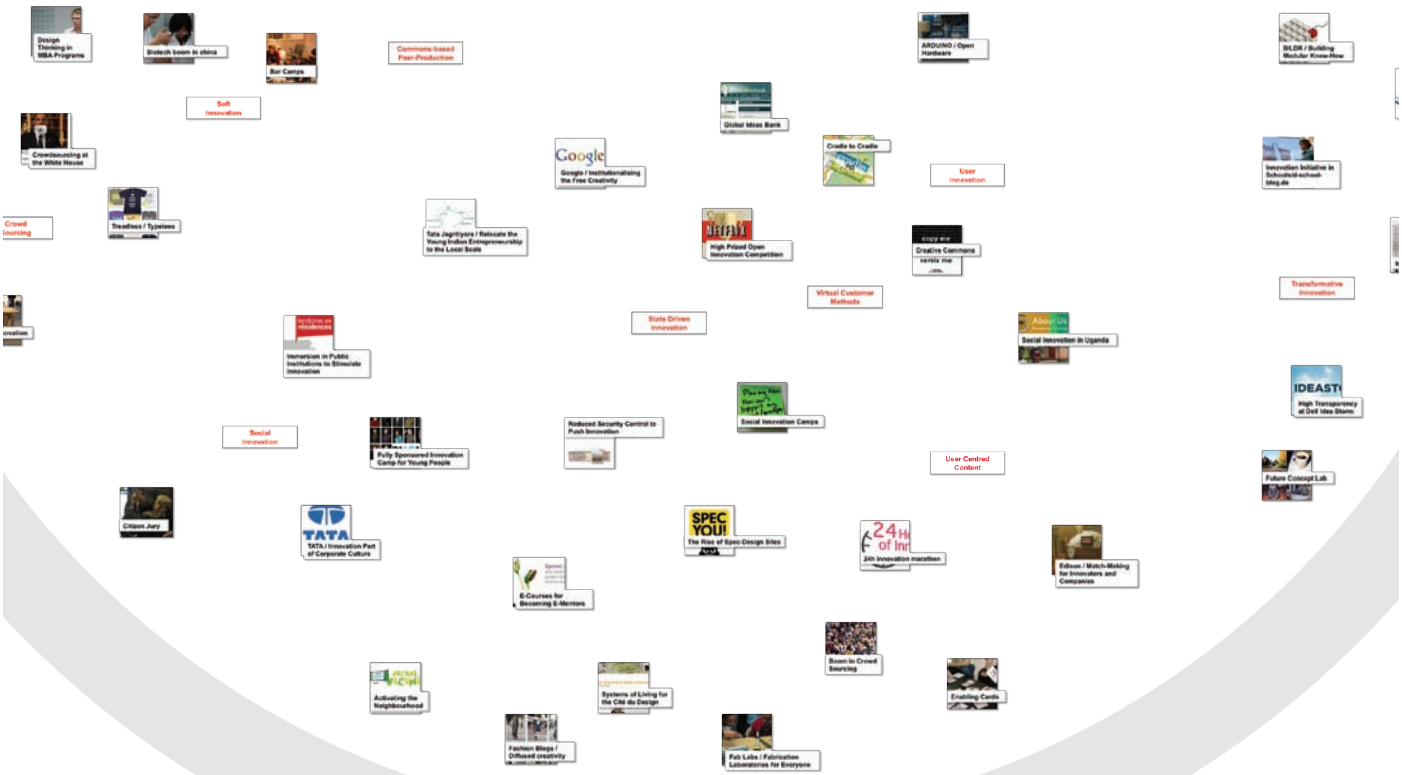
These consolidated visions were then confronted with different possible socio-economic framework conditions and global mega-trends in order to finally synthesize consistent scenarios which integrate micro, meso and macro elements of possible innovation futures with particular emphasis on changes in the nature and content of research.

New innovation patterns may have diverse impacts which include, amongst others, new innovation schemes for production patterns (distribution and location of production), ii) environmental impact of new innovation patterns, and iii) implications of new innovation forms for regulatory framework conditions. Based on moderated group discussions implications with respect to key societal challenges and policy goals are discussed.

The results of this main task are described in the subsequent chapters. In the appendix a list of all the involved experts in the various stages is disclosed. Moreover, a short description of the identified signals of change and the key factors, which served as bases for the scenario construction, can be found in the appendix. For more information, see also the list of deliverables of the INFU project (References). These deliverables can all be downloaded from the INFU web page: www.innovation-futures.org.



Weak signals of innovation



2/ Evidence for changing innovation patterns

The INFU project started with identifying specific examples of how private and public actors in Europe (and US, Asia, and Africa) develop and implement innovations in a new organisational way. We conducted a review of the relevant academic literature and searched other media sources such as newspapers, magazines and the web for new emerging innovation patterns.

Due to the broad definition of innovation that encompasses economic, social, and public domains, it is important for us to precisely define what we mean in the process of identifying new patterns of innovation. We therefore deal with product, process, organisational, service and social innovations while referring to established literature in those areas. We are interested in how the process of the creation, development, and introduction of innovations is changing and so concentrate on the process of "innovating innovation." By examining the underlying principles of how the innovation process is organized, we hope to point out new perceptions about innovation, new actors, and new interpretations in society.

Describing "new innovation patterns" requires a definition or at least an understanding of what is new. In this context, many empirical studies deliver evidence that "innovating innovation" is an evolutionary process rather than a radical one. We consider the linear, closed innovation model to be the traditional innovation pattern or paradigm. This model has become more networked, interactive and open in the last two decades; a development which has been supported by the use of modern information and communication technologies (ICTs). In contrast, new innovation patterns such as crowdsourcing, systematic support for user innovations, extreme personalisation (make-to-order) or cradle-to-cradle innovation are considered as new forms of innovation. Certain concepts and strategies may still be regarded as "new" in specific industries. Therefore, by "new innovation patterns" we mean novel emerging concepts, ideas and strategies of how innovation is organised, along with well-known trends such as open source software development that are important in specific industries or areas.

2.1 / **Changing patterns of innovation: Academic literature**

Academics have often defined and discussed concepts such as open innovation (Chesbrough), user innovation (von Hippel), design innovation (Verganti), crowdsourcing (Howe), and social innovation in their literature. These concepts partially characterise a new outcome or output that, would require new processes and organisational models, such as a new service.

Within the INFU literature review, the consortium identified 16 concepts, strategies, and paradigms describing new ways of organising innovation, which have been discussed intensively in recent years. In parentheses, we include the most important proponents: Open innovation (Chesbrough), User innovation (von Hippel), Value innovation (Kim and Maubourgne), Virtual customer methods (Dahan and Hauser), Innovation communities (Nuomi), Commons-based peer-production (Benkler, Herstatt and Raasch), Crowdsourcing (Howe), Personal fabrication (Gershenfeld), Soft innovation (Stoneman), design innovation (Verganti), Eco-innovation models (Stahel, Braungarth, Lovins), Service innovation patterns, User-created Content (OECD) Public sector innovation (Windrum and Koch), and Social innovation (Mumford). To a certain extent, these concepts overlap with other notions and models, to which we refer in our eleven concepts as variants or synonymous terms and the like. An example of this is how swarm intelligence can be considered as a form or element of crowdsourcing. These parallels will be clear within the report.

In the following pages, we will provide a short overview of some of the most relevant developments in innovation studies. Open Innovation is among the most prominent concepts heavily discussed in the academic literature and business press, which have already entered into policy debates. The most prominent term discussed within the literature is the concept of open innovation. Chesbrough (2003) defines open innovation as "a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology" (Chesbrough 2003, xxiv). Chesbrough argues that in order to exploit all technological possibilities, companies must combine the knowledge generated inside their company with compatible outside knowledge from institutions and other companies.

The concept of open innovation was discussed within the innovation management literature, as well as the innovation policy community. Some policy makers consider open innovation to be a strategy to enhance the innovativeness of industry and raise the productivity of R&D investments. For instance, the OECD in this context has launched projects (OECD 2008) and organised conferences where companies such as IBM or Hitachi presented

their "open innovation strategies" (OECD 2005). Chesbrough's (2003) concept attracted a lot of attention probably because it astutely pointed out the necessity to combine both external and internal knowledge resources and to realise innovations alone and by following external commercialisation pathways.

The idea of an open, highly interactive, innovation process is not completely new. A scan of just a few scholars results in Rosenberg (1982), von Hippel (1988) and Lundvall (1988), who have already drawn attention to the importance of integration and co-operation with customers, suppliers, universities and competitors for successful innovation activities in the 1980s. However, with the term user innovation, von Hippel argues that this phenomenon goes beyond the traditional customer orientation as propagated by marketing and market research, e.g. by optimizing already developed products and validating product concepts. In this sense, product development is "outsourced" to the customer, who creates his own products, while the manufacturer provides the tools necessary for the customer to develop and adapt products. The existence of user innovation is also a key argument against the linear innovation model.

A number of concepts in the current academic debate address the emergence of internet-based large- and medium-scale collaborations among individuals as a new mode of production. New ICTs and more generally online sharing through the Internet has allowed the integration of users and other partners within the innovation process. For example, with the help of new information and communication technologies, virtual customer methods represent a novel way of recording the "voice of the customer" (Dahan and Hauser 2001).

The concept of innovation communities is closely related to this development trend. Innovation developed by communities, such as the open source community at MIT, started in the 1980s, when users were willing to freely share their developments in order to utilise a larger number of researchers and developers and therefore improve their products. Innovation communities consist of individuals or firms interconnected by information transfer links, which may involve face-to-face, electronic or other means of communication. Innovation communities may consist of users and producers. If they involve users, they are often referred to as user communities. Open Source Software (OSS) development is one form of a community-based innovation. Linux, the Apache web server and computer games are the most well known examples of this type of innovation.

Jeff Howe (2006) first coined the term crowdsourcing, which is the idea that problems are broadcasted to an unknown group of solvers in the form of an open call for solutions. Crowdsourcing can be interpreted as a way of applying the open source concept to physical products that do not lend themselves well to the open source type of peer production in current economic

framework conditions. In contrast to open source software development in crowdsourcing, a client deliberately initiates the activity. Any products or solutions generated by the crowd become the property of the client.

New innovation models have also been developed and proposed in relation to production. Personal fabrication means the generation of unique products according to the requirements of an individual. The concept was introduced by Neil Gershenfeld (2005) based on the work of the Media Lab at the Massachusetts Institute of Technology (MIT). Gershenfeld's team developed and deployed "fab labs" that combine various technologies such as laser cutting, which enable people to generate a wide range of diverse products on the spot. Some authors such as Gershenfeld suggest that personal fabrication has the potential to replace the paradigm of industrial mass production. This implies a massive use of digital fabrication technologies within a home environment (desktop manufacturing) or local context (neighbourhood factories, mini factories).

Verganti (2009) analysed companies such as Apple, Nintendo and Alessi, examining their attempts to develop and create new products. He attempted to identify their sources of competitive advantage, which would have been difficult to imitate. According to him, products such as the iPod or Nintendo's Wii overturned our understanding of what a video game means or how we listen to music. Verganti illustrates how design-driven innovations are developed, a process that does not necessarily involve users. Indeed, users may even harm this process in some cases in the effort to create entirely or radically new meanings for a product. Verganti advocates prioritizing design and push innovation strategies. He shows that particular technology-push and design-driven innovations co-evolve, as technological and socio-cultural developments are also tightly intermeshed. While for R&D managers and engineers design is often considered a marginal aspect of product development (e.g. to differentiate to competitors), design-driven companies are able to exploit the full potential of new technologies by creating new meaning.

Nowadays, a number of researchers similar to (Miles 2005) are arguing that service innovation has its own distinctly different patterns accommodating the specific characteristics of services such as intangibility, relevance of perception of performance, simultaneity, interactivity, relevance of location. Hybrid value creation (Möslein 2009) indicates integrated product-service systems involving the blurring of boundaries between the manufacturing and service sectors.

Eco-innovations are product, process and system innovations that reduce energy and resource consumption at any stage of the product lifecycle (Bleischwitz et al 2009). Some authors (Bleischwitz et al. 2009, OECD 2009a)

have suggested that effective eco-innovation needs to be based on radically different innovation models. One type of new model aims to ensure the consistency of material flows affected by an innovation with resource flows in the eco-sphere. One concept that has become quite prominent recently is the "cradle-to-cradle" approach (Braungart and McDonough 2006, Stahel 1982), which implies a radical "upcycling" approach to innovation and design. Here the idea is that all waste materials are productively re-incorporated into new production and use phases, i.e. "waste equals food." The cradle-to-cradle design concept is intended to develop highly profitable products, the components of which are able to circulate in biological and technical loops with positive effects on the environment and health.

While the primary concern of innovation literature has been typically occupied with the private sector, the focus has shifted in recent years to the role and importance of innovation in the public sectors (Windrum and Koch 2008). Innovation processes in the public sector normally involve both the service level, (front end service providers like hospitals, schools, police departments, agencies, etc.) and the policy level with its policymakers (civil servants and politicians in regional administrations, councils, ministries, etc.).

Finally, the notion of social innovation – although this type of innovation is not new – has gained interest in both academic and policy debates in the last couple of years. Some would argue (Manzini 2008) that social innovation defined as a specific form of output also is associated with a specific process. Some authors have defined social innovation by its target, which is comprised of social needs rather than market opportunities that get unlocked. For instance, the authors of a NESTA report on social innovation (Mulgan et al. 2007) argue: "We define social innovation as the development and implementation of new ideas (products, services and models) to meet social needs". Another strand in the academic literature discusses social innovation as a different mode of innovation characterised by a hybrid profit/non-profit structure. These authors emphasise the crucial role of the non-profit sector of the economy in social innovation. A third line of debate focuses on social innovation as a change in behaviour and relationships rather than the introduction of new products and technologies. In this context, Manzini (2008, p.28) offers the following definition: "Social innovations: changes in the way individuals or communities act to get a result (i.e. to solve a problem or to generate new opportunities). These innovations are driven by behaviours changes (more than by technology or market) and they emerge from bottom-up processes (more than from top-down ones)."

2.2 Changing patterns of innovation: Signals in print media and Internet

The literature review was just one factor in our search for the most likely future developments in organising innovation. In addition to the literature review, the INFU team collected a set of most recent real examples how very different actors of the innovation system organise innovation. We therefore scanned an assortment of business press, magazines, and Internet sources for new patterns, examples and models for innovation, labelled as so-called 'signals of change'[4]. It was our intention that the scanning activity should confirm or amplify some of the concepts proposed in the academic literature. The team developed a framework that exploits results from another project (iKNOW project) conducted in parallel to INFU and funded under the Blue Sky Foresight Programme.[5]

A signal is defined as a hint of a potential for change with a possible strong impact that is already apparent and visible, but has not yet entered the mainstream. In this case, a signal thus indicates a change in an innovation pattern which is not established as a common way of doing innovation (in a sector).

In total, we identified 63 signals of change and collected structured information for every signal of change. The identified examples and cases often combine existing ideas, concepts and strategies (described in the literature) in innovative ways, show new applications and thus expand our thinking about possible innovation futures.

The signals of change were clustered into 14 broad forms of innovation. This clustering delivered a first indication for major trends and possible emerging innovation patterns. However, this first taxonomy was not univocal as many new forms of innovation are characterised by a combination of new features.

In the following pages, we introduce the clustered innovation patterns and a few selected signals for each cluster (see Appendix C for a short description of all 63 signals of change):

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4 *Amongst others we used newspapers (e.g. Süddeutsche Zeitung, New York Times, BBC News, China Daily, The Mail (South Africa)), Magazins (e.g. Technology Review, Harvard Business Manager, The Economist, Wired) and web pages and blogs (e.g. www.work-innovation.de/blog, blog.futurelab.net, endlessinnovation.typepad.com, insideedgeinnovation.wordpress.com, www.eurekanetwork.org/home.do, www.business-strategy-innovation.com, innovation.alltop.com, www.mass-customization.de, www.crowdsourcing.com, blog.openinnovation.net, www.innovationwatch.com).*

5 *See: www.iknowfutures.eu.*

Idea Generation

A number of signals deal with the way companies identified and adopted new ideas, often by using very different sources and approaches.

We identified one signal as "Street Fashion Blogs." At their core, Street fashion blogs are the initiative of anonymous people posting pictures of other people in their area that they consider dressed in an original and cool way. Most of them are not professional cool hunters. Some of these blogs are increasingly recognised as inspiration or trend setting by the fashion community. A series of these street fashion blogs have then been used as sources of inspiration for the fashion community and for trends watching in general. The innovation process consists of a diffused community of people all over the world (especially in places recognised for their trend setting influence) selecting innovative signals in the everyday life and provides them as a tool for creative industry.

The MINATEC l'atelier arts & science is another interesting case. This partnership between l'Hexagone Scène nationale (a 560 seat theatre) and the CEA Grenoble, one of the ten most important worldwide research centres in micro and nanotechnologies that aims to help artists and scientists inspire each other in their practices. The stated objectives include giving both artists and scientific researchers the opportunity to exchange ideas on their respective working fields and practices, and to work together to integrate new technologies into artistic productions. Regular working residencies provide chances to collaborate for a set period of time, from a few days to several months.

The so-called Breeding Tables is another example we detected. The innovation process here consists not of designing tables but software that designs an infinite number of table models with a standardized production process. Randomness is put at the hearth of the design process. The computer code creates many possible random variations, but the final defining pre-production choices are still made by humans. This is then integrated in a mass-production process, taking into account the specifications of parameters like height, depth, width and load capacity. These computer-generated cutting patterns and associated processing information orchestrate computer controlled laser cutters and bending machines while seamlessly materialising three-dimensional corpuses.

Innovation Culture

One example of innovation culture is the case of Google. In a keynote speech, Google's former CIO Douglas Merrill describes Google's approach concerning internal innovation culture as offering employees as much freedom as possible in their working/innovation processes such as letting

them choose any operation system, location and software they want to use. This approach has bolstered the company's rate of return. It also has an effect on Google's security policies: Google tries to close the upcoming security-gap in its own infrastructure by doing things such as securing their servers rather than opting for the traditional solution, which would be to secure each employee's device (and thereby restricting the devices that can be used: software, computer, browser, etc.). This is a signal that the traditional conflicts between security issues and an open innovation culture are coming to a head. Therefore companies are looking for new ways to harmonise the two aspects.

User Integration

The role of user as the dominant source and driver of innovation activities is well known and stressed by the concept of user innovation (see above).

Dell's Idea Storm is an example of a novel way to integrate customers. Dell gives interested users the chance to post ideas on products, best practices and general topics. Other users can comment and further promote or demote items. In a specific section of the website, users and interested visitors of the website are able to access general stats such as the overall number of posted, promoted, contributed and implemented ideas. This enables users to track proceeding stages of all contributions.

Sample Lab!, located in a very crowded shopping area of Tokyo, is yet another signal of change. It is a store where products are displayed only for demonstration. Visitors come, try the products, and get rewarded by taking home some of the products that they tried. It is a retail experience that focuses on consumers, giving them a certain degree of choice while promoting and testing products and innovations. It redefines the model of "tryvertising," which is 'try before you buy.' The members can actually try out the latest products, often prior to official release. In return, they complete surveys that assist brands, designers, and manufacturers improve and fine-tune their products for the mass market. This method allows companies to undertake controlled testing process of their products, while having results that are easily tracked with users who are willingly profiled.

Crowdsourcing

Crowdsourcing is an important trend first described a couple of years ago by Jeff Howe, an American journalist. We identified a number of crowdsourcing examples from public and private organisations that formulated various calls for problem solving contests.

One prime example we have identified is the following: The American online video rental shop Netflix offered $1,000,000 USD for the team who was able

to improve movie recommendations made by Netflix's internal software, Cinematch, by at least 10 percent. It took 3 years until a team surpassed the 10 percent hurdle. The winning team was comprised of some of the top international teams of the competition. Such outstanding, highly rewarded, open innovation models do not primarily aim at collecting as many ideas as possible from various stakeholders, but rather focus on attracting highly skilled professional teams that combine their knowledge to solve a daunting challenge.

The ideas contest "Save our Energy – The energy efficient city 2020" is funded by the German Federal Ministry of Education and Research and part of the project "OFFIES 2020+: Open Innovation Processes for the Energy Efficient City 2020+". Among others, the universities of Munich and Erlangen-Nuremberg and the city of Munich organize it. The purpose of the contest is to animate as many people as possible to generate and advance innovative concepts on energy efficiency in the fields of mobility, habitation and combinations of both fields. The ideas are commented upon by other participants and evaluated by experts. The best ideas in each field are awarded with material prizes and further optimised in idea-workshops. The interesting aspect of this project is the transfer of open innovation tools, which are more common in the business sector, into the public sector and areas of city planning and urban culture. This might be a sign that future communities will open up to the integration of citizens in political implementation processes. This could foster social innovations and behavioural changes and speed up their diffusion.

Closing Innovation

While almost everyone is talking about the opening of the innovation process, we found some examples for a reverse trend that indicates companies are attempting to close off their innovation process.

Apple delivers one weak signal for such a development: In Summer 2009, an employee of one of Apple's manufacturers committed suicide after losing a prototype of a next generation iPhone. There were rumours that he was mistreated and his house was searched illegally. Apple, commonly seen as one of the most innovative brands, treats its upcoming products with the utmost secrecy. Apple thereby contributes to the hype created by its uncountable communities of followers, and websites that offer live-tickers during Apple Keynotes (conferences where Apple launches new products), popular to the extent that they must shut down their normal sites and use all available server-power to withstand the run of followers. Apple's success could be a weak signal for an emergence of closed and top-secret innovation strategies. Using the hype surrounding a brand, companies are creating

consumer-religions. The employee suicide is an extreme example of how very serious this could potentially become. This signal could also indicate an increasing avoidance of open or user-integrated innovation in the consumer goods industries in favour of a focus creating myths.

Legal Frameworks

Creative Commons and petitions for a new European patent system were two signals of change related to legal frameworks.

Creative Commons (CC) is a non-profit organization offering creative licenses that enables creators to let their work be shared, reused and remixed by other people in part or as a whole in order to generate other innovations still consistent with the rules of copyright. The creative process is based on the availability, searchability and easy access of innovations so that anybody can reuse, combine and generate other innovations. The aim is to increase the amount of creativity (cultural, educational, and scientific content) in "the commons," the body of work that is available to the public for free and legal sharing, use, repurposing, and remixing.

Public Innovation

We identified a couple of examples concerning innovation in the public sector, which is becoming increasingly important.

One model with which some may already be familiar is the Danish MindLab. It is an interesting case of a public sector organization increasing its innovativeness. MIND LAB is a cross-ministerial innovation unit based in Copenhagen, which involves citizens and business to develop new solutions for the public sector. MindLab's mission is to include both citizens and enterprises in developing innovative solutions for public administration. The innovation process consists in transforming the ministries' mode of operation through more user involvement, including developing and sharing user innovation knowledge in both public and private sectors, as well as through activities that cut across the public sector. Examples are MIND LAB's work on integration and equal opportunities, digital solutions, climate change and business regulation.

Social Innovation

We found a number of examples that are typically forms of a social innovation, described below.

"La festa dei vicini di casa" (meaning: the party of the neighbours form the same condominium), is an event that aimed at promoting the idea of neighbourhood amongst citizens. The innovation process consists of providing an online toolbox to help citizens organise their own customised version of a daily living solution.

The website-based toolbox provides procedures, advice, pre-formatted brochures and leaflets, and check-lists of good practices designed to assist in even simple tasks like organising a party with close neighbours, empowering people to take action and organise more of these types of initiatives.

Social Innovation camps is another case we have collected. The Camps are weekend-long events bringing together web developers and designers with people communicating very specific social needs. They consist of competitions to find the best ideas for web tools to create social change and a race to build prototypes for over the course of one weekend, complete with working software. The events finish with a pitching competition and a chance to win a prize as well as help making the idea a reality. These workshops create a space where people (citizens) have the opportunity to solve everyday life problems they experience in collaboration with specialists from different backgrounds, with all of them contributing for free. It is a hands-on process that aims to create relationships needed to launch these micro social innovation groups that, at the end of the workshop period, result in a web-based solution that they will implement in order to ensure continuity of the process.

Open Design

We identified examples for innovations that used open source software development as well as personal fabrication.

One case of open design is Bildr, a project of open platform offering access to modular instruction sets that provide "building blocks" for making various hardware and software constructions accessible to anybody. The innovation process is based on a very detailed toolbox that allows non-experts to assemble and combine them, creating a progressively newer electronic system while simultaneously familiarising them with IT environments. Bildr is an attempt to integrate existing DIY (Do-it-Yourself) electronic kits with the availability of functional pieces of information and know-how available in open source on the Internet. It integrates into a larger semi-formalised system of construction developed by the electronics DIY community itself. The objective of the trend towards DIY electronic kits (i.e. PIC, Arduino) is to free grass roots creativity and make this powerful technology accessible to anybody.

Another example of open design is Oscar, the Open Source Car. The objective is to jointly develop a car on the Internet according to open source principles. Thus, the software and hardware used in the project are freely accessible to everyone willing to participate in the project. Open source concepts are quite established in the scope of digital goods and software development. However, transferring the principle to tangible products could, in the long run, lead to a democratisation of innovation processes.

Global Knowledge Sharing

Many signals of change reveal that using different sources around the globe simultaneously is conducive to fostering innovation.

Sprout – an E-course for idea creation, offers an electronic course in which people from all over the world can exchange their knowledge and help each other to further their social or environmental projects. Sprout tries to attract dynamic activists, leaders, and professionals, who are trained by sprout facilitators to become "e-mentors". Everyone can be a mentor and help other young people with their expertise and knowledge obtained by similar means. Sprout exists to help make the process of innovating simpler, more practical and less intimidating by guiding a person through the project management process step-by-step. It provides a way to learn, grow and connect in a supportive environment that encourages creativity, involvement and hard work to create a better world.

Another signal of change is the Global Ideas Bank, which is one of the greatest ideas site on the Internet today. A not-for-profit website that is "part suggestion box, part networking tool, part democratic think-tank and part inspirational entertainment." The innovation process consists of a large open contest where individuals provide any manner of ideas and vote for the best ones. The origins of the Global Ideas Bank's lie in the Institute for Social Inventions, which was set up back in 1985. It was part of the first European Social Innovations Exchange and has been a source of inspiration for countless individuals and organizations.

Whole Brain Catalogue: A team of researchers from UC San Diego developed this open environment has been developed by in order to connect members of the worldwide neuroscience community and facilitate solutions for new challenges in brain research. The innovation process consists of opening the academic research typically limited to a few universities under contract to a larger community of research. The innovation begins putting scientists first as a community of researchers rather than privileging the university institutions. A website shows slices through the brain, 3D representations of brain parts, as well as cell and molecule models. Users may contribute all the multiple scales of data using upload tools to semantically tag their data, which makes it readily searchable. Researchers can create their own views and combinations of data to reveal unique views.

Attitude towards Innovation

We found signals for both very positive attitudes for innovation or more sceptical views on innovation.

The "24 Hour Innovation Marathon" is an inspirational example. On May 15th, 2009, the Board Of Innovation, an online network of innovators, organised a 24 Hour nonstop marathon of innovation projects around the world. During a full

day and night, more than 60 participants presented their innovation initiatives in predefined time slots, ranging from small innovation blogs up to large multinationals. This event included live-streamed brainstorming sessions, free access to an inspiration-database and multimedia presentations of all the latest innovation projects.

An example of a weak signal we identified was "Putting the No to Innovation." In the beginning of 2009, the American cereals manufacturer Post came up with a new campaign under the tag line "Why we put the NO in Innovation." By emphasizing the 100% natural ingredients and the fact that the product has not changed for centuries, the company motivated its employees to be proud of an apparent lack in progress and innovation their company over the years. This signal could be indicative of a trend that would have more companies starting to actively distance themselves from an innovative image. Instead, they merely focus on their "evergreens" and rely upon old but proven and successful products with a stable market share, e.g. Post, Coca Cola, etc.

Shift in Innovation Gravity

Our environmental scan found a number of developments in India and China that indicate this region is becoming increasingly important in the global innovation race.

One example is the Tata Nano from India: In January 2007 Tata Motors, India´s largest company in the automobile and commercial vehicle sector, launched a four-seater car with a purchase price of around 1440 Euro. The Tata Nano is now the world's cheapest car. Automotive suppliers are, amongst others, the German companies Bosch, Continental and BASF. In order to achieve this very low price, Tata Motors reduced the production costs by radically decreasing the car's performance and focusing on a strictly low-cost-design. Tata is now in a "pole position" to conquer a major future growth market: low-price cars, as 90% of future growth in the car sector will take place in emerging and developing regions.

Additionally, we observed that increasing innovativeness is a high priority for Tata. A firm belonging to India´s Group, Tata Consultancy Services, puts internal innovation corporate culture at the top of its list. They have implemented several strategies in order to build a culture of innovation and stimulate employees to think differently. For instance, a strategy involved creative thinking as one of nine performance categories upon which employees are evaluated, along with making innovation an essential component of all trainee programs. Furthermore, employees may use five hours out of their 45-hour workweek to develop ideas on new concepts and product improvements. There is also an internal social network that permits employees to post, comment and vote on ideas supporting the idea generation process.

Lifecycle Thinking in Innovation

A number of examples indicated a trend towards sustainability and the development of eco innovations.

"Venlo – A Whole Town Adopts the Principle of 'Waste is Food'" is one signal of change we have collected in this context. Venlo (NL) and its 90.000 inhabitants adopted McDonough and Braungart´s concept of cradle-to-cradle (waste = food) as a vision for their city. This joints the industry with politicians, creatives, and the general public in a giant collective project. Entrepreneurs involved with Venlo saw it as a great tool for innovation that also makes sense economically while saving our planet. The Venlonians agreed that the concept is very difficult to put into practice by the industry, but cradle-to-cradle is a common goal towards which they all work, share ideas, raise questions, find answers and take actions to make it work. Truly applying the principle of "waste = food" changes the innovation process of products since it forces designers and innovators to consider the entire lifecycle of each component and / or make the best of those materials, which can be fully recycled or up-cycled.

Our review of the academic literature also revealed that some concepts were addressed within the business press or in the web have not gained much interest or attention by academics. Here, we highlight product tuning, modular reconfiguration, or interactive production as some of these concepts.

Within the project we also investigated drivers for the innovation patterns. That is, whether or not they were economically, technologically, socially, and/or environmentally driven. The collection of signals of change revealed that many examples were driven by a societal need, which, for us, signalled a drive by peoples´ growing ability and willingness to engage with social media and collaboration tools. This driver is closely connected and repeated attributed to the younger generation that is about to enter the business world, bringing with them new ways of thinking about (free) knowledge sharing, collaborating and inventing. Another common driver in the social dimension is the spread of individualisation, which, as one effect among others, increases peoples´ ambitions to express themselves by influencing the design of products and / or to change the functionality of solutions and services according to their individual needs. Last but not least, we noted that there is a change in the way innovators and the idea of being innovative is socially regarded. It appears that being innovative is becoming more socially desirable for a growing number of people.

The most relevant driver in the economic dimension was the increasing global competition for innovations. The pressure to innovate is rising due to ever-shorter product life cycles, growing product piracy, and the transition of industrialised societies into knowledge economies. Another economic

driver of changing innovation patterns are changes in the work world that include flexible working patterns, outsourcing, and the increasing number of professional freelancers. These factors foster and enable the emergence of new innovation concepts. Moreover, as companies have started to realize the direct (money) and indirect (reputation) economic value of social and environmental innovations, there is a growing interest in both these areas. Geographical changes in innovation patterns, in particular, the shift of innovativeness to developing countries, are driven by cost advantages and rapid economic catch-up in those countries. In addition, many economic obstacles were identified during the scanning process. The most frequently mentioned were high costs and poor cost-benefit ratios, as well as low monetary incentives for the participants.

From a technological perspective, Web 2.0 applications are bringing about changes in innovation patterns, as they make knowledge sharing and collaborating easier and more affordable on local and global scales. Furthermore, many new innovation concepts are expected to result from the upcoming wave of sustainable technologies and progressively cheaper, powerful, and usable technological devices. One obstacle we encountered was the criticism that most modern electronic devices are only designed Western settings, where water and / electricity is taken for granted and the like. Moreover, IT security gaps have been identified as a hindering factor.

Some signals were politically driven. First of all, politicians try to influence the conditions under which innovation takes place, by promoting collaborations amongst domestic companies, or by providing financial support. Additionally, governments and governmental institutions increasingly invite people to participate directly in political decisions in order to counteract the growing disenchantment with politics. The obstacles pointed out refer to political frameworks for open innovation: If laws and regulations are not designed specifically to handle the new innovation concepts, they may curb new ideas. Some new innovation approaches may not establish themselves due to a lack of political support.

From an environmental point of view, the growing awareness of climate change, social grievances and the inefficient use of resources are driving changes in innovation patterns. However, new innovation concepts could fail for precisely these reasons if they turn out to be resource-inefficient or to produce tons of new waste.


Weak signals of innovation

3 / Organising innovation in the future: 20 visions of innovation patterns

The set of identified signals served as base for the development of 20 innovation visions, which, in a creative way, amplify and combine with one another in order to develop coherent, plausible, and sometimes provocative pictures of possible future forms of innovation. Thereby the team transferred an idea already applied to other sectors or generalised a signal considered to have become mainstream practice (see also the Video on the INFU web page).

Three principles have been used for amplifying the signals of change with the aim to construct plausible visions:

- Transfers to other sectors or user groups. For instance, transferring and idea from the fashion to furniture industry or making an application for elderly people instead of kids would be considered a transfer of this nature.
- Generalisation as the mainstream practice: for instance, by asking if users active in innovation processes would become the default.
- Radicalisation of the principle by asking: for instance, what if user involvement in the innovation process actively developed into an innovation by the demand.

Integrating and amplifying more than one signal have created the majority of visions, which are often similar in their fundamental features. In addition, the current stage of development, rationales for the future developments, risks, opportunities and implications were briefly discussed.

We briefly introduce the 20 INFU visions.

Innovation on request

What if companies generate most innovations on special request from user communities?

Together with sociologists, designers and developers communities of users develop innovation scenarios and sell them to companies.

Public Experimentation

What if experimenting aligned social and technological innovation was at the core of successful innovation systems?

Public authorities strive to foster a permanent stage of social experimentation through a loosely connected network of local bottom-up projects. Enablers for collective experimentation such as innovation toolkits form the critical infrastructure for public experimentation.

Bringing outside in...

Bringing outside in

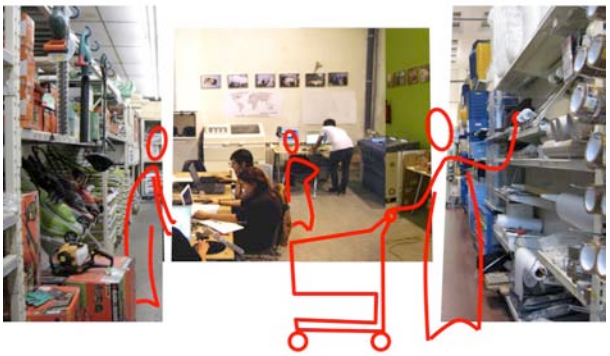
What if the idea creation process is fully externalised to outside agents ?

More companies use different sources of outside knowledge for the creation of products and services, which are then realised and brought to the market by the manufacturer. Strategies such as rapid innovation testing, crowdsourcing or sample testing are applied.

Negotio-Vation

What if innovation becomes publicly negotiated?

Companies make open calls to citizens for innovation proposals, competing to get 'innovation credits' from them in order to get approved the development of the new product.



CIY – Create It Yourself

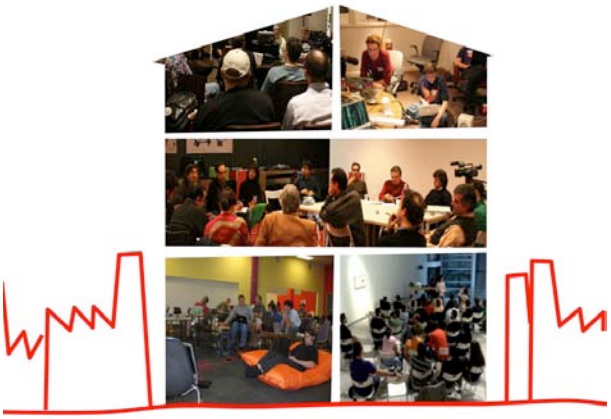
What if fabrication laboratories for everybody with flexible manufacturing equipment, become widely available and allow people to produce ever more products themselves?

Self-production of personalised objects is the standard way of producing commodities directly at home or in "create it your-self shops/malls" with optional professional support. Companies just deliver materials, components, equipment and design tools. Brands hardly play a role any longer.

Laboratory stores

What if stores were to become laboratories where companies and customers co-develop innovations?

Laboratory Department Stores would offer theme worlds such as "Family Life" or "New Sports," where customers can experience unreleased products, individualize existing goods and in return get access to products fitting better their needs and desires.



Innovation marketplace

What if companies no longer innovate themselves but fully externalise innovation to an open innovation marketplace?

Nomadic innovators would bid on innovation tender and con-tests with constantly changing teams. They would gather in co-working spaces, some of which are top-favourite employers for creative people.

Innovation Campus

What if companies collaborated in places of joint innovation?

Independent innovation plants will rent large open spaces for companies to settle their innovation staff with private areas and many types of collaborative facilities in between.

Innocamps

What if innovation camps, where people gather for a few days to innovate, become widely established as a means of problem solving?

Innovation camps are used by companies, public sector and civil society to solve problems from high-tech challenges to neighbourhood facilities. Most people join innovation camps on a regular basis.

Open Source Society

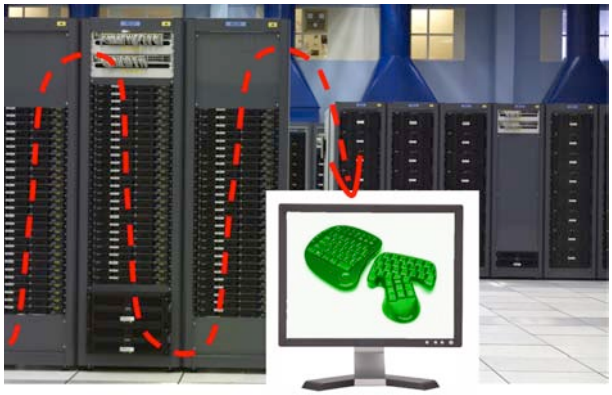
What if open source development is no longer limited to soft-ware development but becomes an all encompassing innovation pattern?

Many products and services are provided by people contributing bits and pieces to various technological and social innovation projects. Open source business models and coordination mechanisms abound.

Virtual-Only innovation

What if many innovations were enjoyed only virtually?

Virtual-Only products satisfy human appetites for newness. They are displayed in virtual galleries for public perception or projected into homes and offices for individuals on demand. Most of these products never materialise.



Darwin's Innovation

What if companies use digital systems to randomly create and test innovation variants before selecting the "fittest" for further development?

A number of variants are tested often with unexpected out-comes. Design, creativity and consumer research lose relevance. Engineers dream of ultimately simulating the end-user and thus fully automate the innovation process.

Web-Extracted Innovation

What if we scan the Internet for ideas and automatically pick the ones that best answer current customer needs?

Sophisticated semantic web-filters track changes in consumer preferences and new ideas in real time, and automatically extract innovations with outstanding market potential through big data.

Innovation Imperative

What if the current emphasis on innovation and creativity for designers, programmers and engineers spreads to all work-places?

All employees from the janitor to top management are constantly involved into innovation activities. Creativity is part daily job routine and is key in performance measurements. Part of the job is to redefine the job itself.

Innovation meets Education

What if innovation skills were high on the education agenda right from kindergarten?

Children are motivated to maintain their "discovery spirit" and learn how to question facts and think differently. Learning is project oriented with a high emphasis on bricolage. Innovation becomes something that is taught as a matter of course, just like the ABCs.

No-innovation

What if innovation fatigue takes over and No-Innovation is en-vogue?

The innovation rush is finally slowing down. Product cycles are becoming longer again. For market success, unchanging quality is more important than ever new offers.

City driven innovation

What if cities became stronger actors in the field of innovation by pro actively pushing for necessary solutions?

Cities could take on the investment risks for the development and implementation of innovations that are needed and use this as a new economic factor by patenting and marketing their solutions to other cities.

90% Innovation

What if innovation is primarily directed at the "other 90%" of the world population living in poverty?

Extreme low cost/high innovation strategies prevail. Wealthy global companies struggle as they lack the competencies and culture required. Innovators from today's' emerging markets do much better due to their long-standing experience.

Relocated Innovation

What if the bulk of successful and disruptive innovations were to come from today's emerging markets?

The West adopts the role of a follower and has to face products primarily designed for different cultural contexts. West-ern companies look to Asia, often with the help of industrial espionage. Creative people migrate to the new innovation hot spots in Asia and send back their money home to the US and Europe.

Waste-based Innovation

What if the principle of "Waste equals Food"/"cradle-to-cradle" got widely adopted?

Instead of raw material, databases with used components and materials serve as a starting point for innovations. The whole world becomes one eternal circle. Everything that is made of something is part of making something else.

Amplified and contrasted visions

4 / Eight elaborated innovation visions

During the course of the project, we further consolidated, discussed and assessed the 20 innovation visions developed in the first stage of the project by involving different experts and interaction formats. The dialogue progressed from first conducting light online interviews with individual experts with the aim of creating nodes of expertise around certain change signals that would then be developed into a set consolidated visions of future innovation patterns. Within specifically organised mini-panels, experts in close interaction with the INFU team members further elaborated upon their common visions, which were labelled as "Mini-panel visions".

We launched an online survey in order to assess the 20 visions previously developed. The questionnaire covered the assessment of five aspects for each of the visions in relation to i) clarity, ii) impact, iii) desirability, and iv) likelihood. Participants were asked to assess each aspect on a six-point scale. Participation was restricted to a circle of people with special expertise in relevant aspects of innovation or interview candidates. Participants were asked for their e-mail address and to give a few basic characteristics regarding their background. In total, 56 experts participated in the survey. The majority of participants were researchers, consultants and creators as well as industry stakeholders and policy makers. The focus was mainly on Europe, though one expert from China, USA, and two from Russia also answered the survey. The specific interests of the experts involved in the survey covered all types of innovation from products and process innovation, social and service innovation, to public sector innovation.

Besides the survey, all members of the project consortium interviewed a varied range of experts. It was therefore essential to use a structured outline for interviews to ensure comparability between the interviews. In the interview, experts were asked to explain their assessment of the visions from the online-survey in terms of clarity, desirability, and impact. In addition to the assessments of the visions, the experts were asked to point out missing aspects and suggest a clustering of the 20 visions. Finally, we discussed which of the visions were most interesting and should therefore be considered in more detail within a "mini-panel." In total, 25 experts were interviewed by phone or personally. To facilitate the overall interpretation and the drawing of conclusions from the interviews, the interview results were sorted by vision and merged into one document.

The majority of participants considered the visions quite clear, with the exception of Vision 5 (public experimentation), which was considered unclear by several other respondents.

The greatest differences amongst visions can be found when looking at the desirability of the visions. 7 out of the 20 visions are evaluated as desirable (to some extent) by more than 70% of the experts. Out of these 7, the vision "waste-based

innovation" (17) and "Innovation meets education" are considered "desirable" by almost everybody. Conversely, two visions were evaluated as "non desirable" by more than 70% of the participants: No-Innovation and "Virtual-Only innovation".

Though there seems to be no consensus amongst the experts on the expected impact of the visions, they were evaluated quite differently. Visions focusing on the way the Internet was integrated in the idea generation (Darwin´s innovation, Web-Extracted Innovation, Innovation marketplace) seemed to be considered of low impact, while a high impact seemed to be connected to the location of the innovation processes (Relocated Innovation, 90% Innovation).

In terms of likelihood, there appears to be no big differences between the visions. The likelihood of all 20 visions seem to be quite uncertain. No vision is considered "very likely" by more than 20% of the experts. Two of the visions are considered to be very unlikely (Negotio-Vation, No-Innovation). Both visions are "negative" visions that describe a slowing down of the innovation process. The experts who participated seemed to be convinced that the innovation dynamic is not going to slow down but is going to instead increase.

A few highlights of the assessment should be briefly summarised here:

'Waste-based Innovation' was assessed both in the survey and interviews as a highly desirable but very uncertain vision. During the interviews, the experts stressed the high potential impact of this vision but also mentioned that there were still tremendous obstacles on the way. There was a striking consensus amongst the experts concerning this vision and we therefore set up a mini-panel focused on this vision.

The vision 'Darwin´s Innovation' was quite provocative. It received highly controversial assessments by the experts ranging from "very interesting" to "bullshit." The qualitative interviews revealed that the vision was rejected because of a perceived insult to human creativity, which most respondents highly valued. At the same time, a small group saw huge opportunities arising from automatised support for creative activities. Some of the experts assessed the impact of the vision in the case of realization as tremendous (the vision ranked top 2 in impact), which implies the need for policy, industry and society to prepare for possible risks and emergent opportunities. In conclusion, this vision indicated a relevant critical aspect change in innovation patterns that should be explored in more depth through further INFU activities.

The 'no-innovation vision' was the vision considered the least desirable. In this respect, participants also assessed the 'relocated innovation' vision, 'automatised innovation' vision and the 'negotio-vation' vision as rather undesirable. More than 40% of the participants said that they did not wish for any of those visions to become reality. In contrast, waste-based innovation was highly desirable. The no-innovation vision and negotio-vation vision were considered as unlikely, mainly because experts felt that these two visions slow down the innovation process.

Based on information gathered by the interviews and the survey, we further expanded and clustered the visions during a symposium that occurred between April and June 2010, along with a June 30 2010 meeting in Brussels. For each vision, the results of the survey and the interviews were revised with respect to: i) synthesis of arguments, ii) degree of consensus, iii) striking quantitative assessments, iv) conclusion for clustering.[6] The results were eight consolidated innovation visions labelled "Nodes of change" for which subsequently mini-panels were organized.

For each of these nodes of change, a mini-panel (= Mini-panel visions) was formed to spell out the vision in greater detail and indicate drivers and barriers to realise the vision.[7] The consortium appointed the mini-panel coordinators on the basis of expertise emerging from the interviews. The panel coordinators then involved larger groups of 5 – 15 people. Each mini-panel developed a vision sketching a desirable "innovation future" outlined the main arguments behind their vision and listed drivers and barriers for the vision to become reality. Each Mini-Panel developed a vision sketching a desirable "innovation future" outlining the main arguments behind their vision as well as listing drivers and barriers for the vision to become reality.

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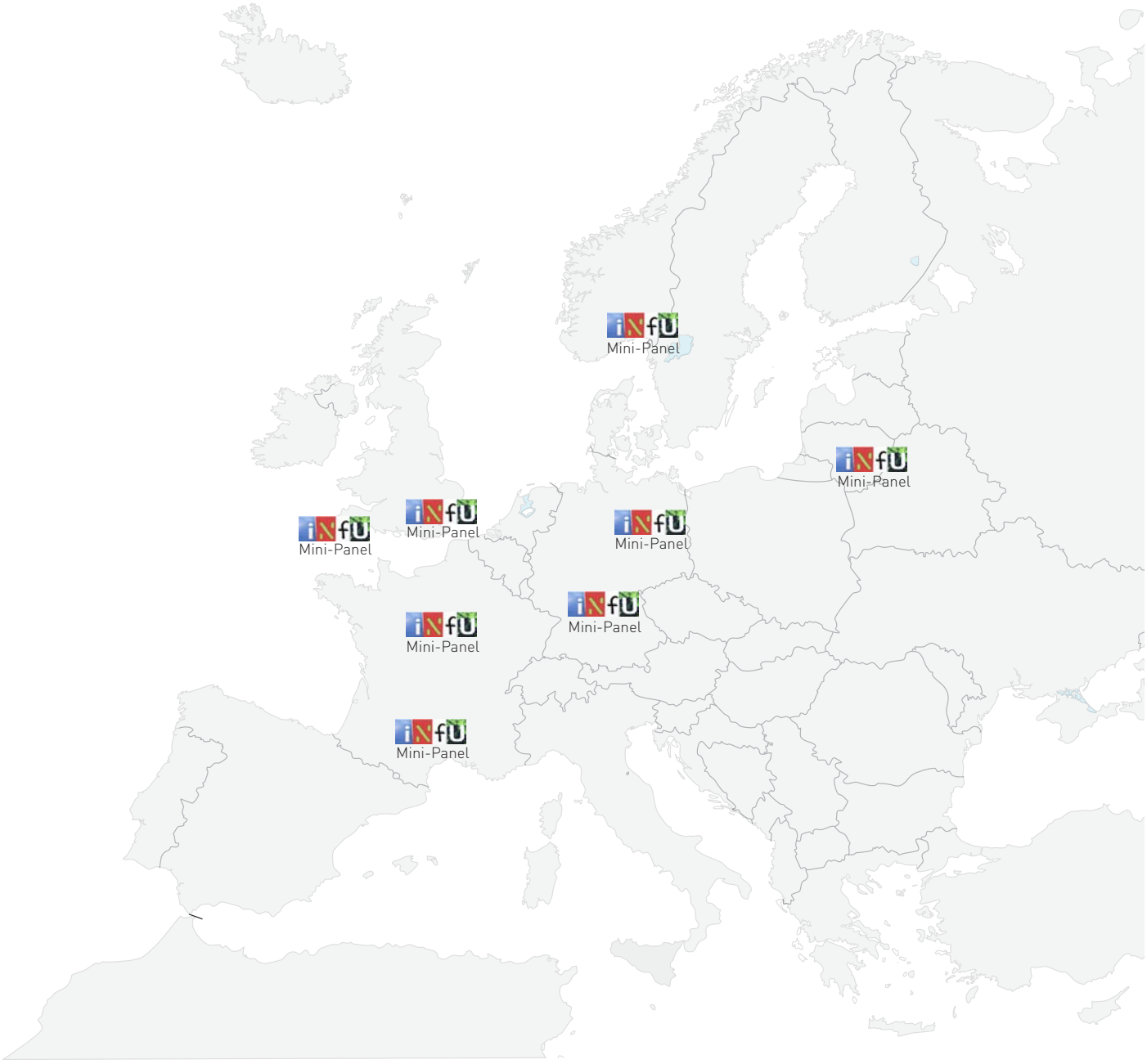
6 *Some visions such as the "Innocamps" and "waste based innovation" were taken up because they received overwhelmingly positive response and a high level of interest. Others such as "automatised innovation" and "web extracted innovation" were selected because of their controversial assessment, which indicates possible demand for clarification. Finally, visions with negative implications such as "relocated innovation" were taken up because of the potential relevance for policy measures and need for increased awareness.*

7 *The INFU findings were presented and discussed at the R&D Management conference in Manchester in June 2010 with an international audience from research and business. Three small groups pointed out relevant implications for three visions: innovation campus, innovation and education, open source society.*

Overview of visions discussed by mini-panels

Innovation vision	Coordinator	Organization/ Country	Approach
Deliberative Innovation	Anders Jacobi	Danish Board of Technology, Denmark	Visioning session among CIVISTI
Innocamp Society	Dominik Windw	Until we see new land, Germany	Workshop with stakeholders of future innovation camps
Social Experimentation	Stéphane Vincent	La 27e Région, France	Drafting of Citizens Agency in a visioning session with actors in social innovation
Automatised Innovation	Patrick Corsi	Consultant and Innovation Management Lecturer, Belgium	Interviews with key and group telephone discussion
Widespread Creativity (Ubiquitous Innovation)	Rolandas Strazdas	Professor Innovation management, Consultant, Lithuania	Creative session with innovation management experts (Vilnius)
Open Innovation City	Daniel Kaplan	FING - association pour la Fondation Internet Nouvelle Génération, France	Workshop envisioning the "open innovation city" with actors from city councils and companies involved with city level innovation
Global Innovation Chain Management (New spatial distribution of innovation)	Anna Trifilova & Bettina von Stamm	Professors Innovation Management; Innovation Leadership Forum, Russia and UK	Three seminars in the framework of international conferences with researchers and company representatives
Waste-based Innovation	Jay Cousins	Founder of Open Design City Berlin, Germany	Workshop in Berlin with stakeholders and key actors from cradle-to-cradle community



Location of Mini-Panels

Overview of the Mini-Panel visions and selected results

Vision

Deliberative Innovation

It seems widely expected that citizens will play a greater role both in governing and implementing innovation activities. How will the new type of "deliberative innovation" be governed, what will be the outcomes?

Key Features

Two main deliberative innovation types:

- Innovation driven by citizens ideas that are actively collected
- Innovation driven by societal challenges initiated by citizens panels

Drivers/Enablers

Political will

Political will

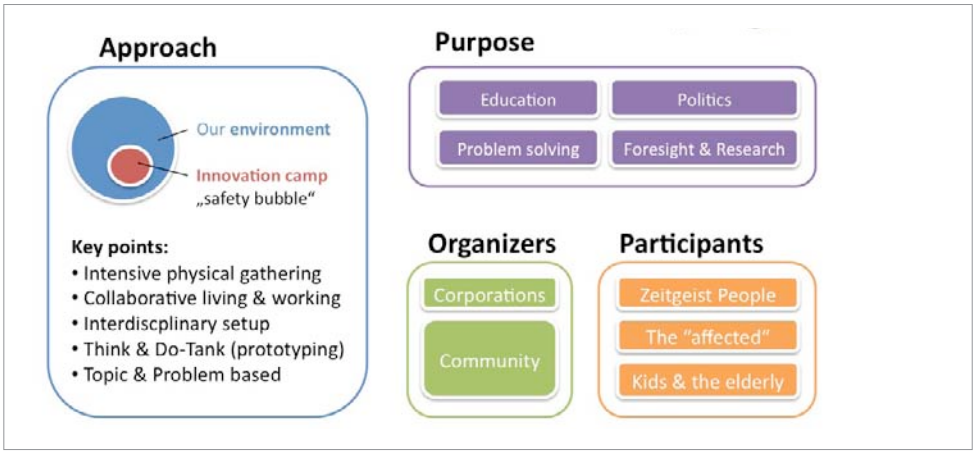
Deliberative Innovation is more relevant, more democratic, based on a greater diversity of knowledge and more fit for pur-pose

Barriers

Lack of political will

Inadequate formats of involvement such as lack of visibility of impact, bad organisation

INNOCAMP SOCIETY



Vision: Innovation Camps where people gather for specific innovation tasks of a certain duration are becoming increasingly popular. Many experts see a high potential for such camps as key enablers of creative solutioning both in

a business and civil society environment. Often the idea is linked to the open source society where a number of products and services are developed in close interaction among users source society where a number of products and services are developed in close interaction among users.

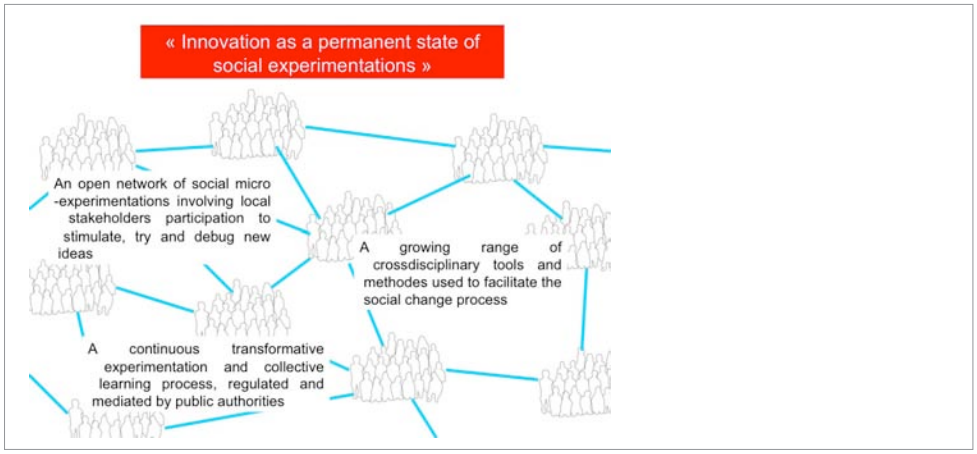
Key Features: functioning as protected spaces for experimenting collaborative problem solving, participatory decision making and learning

Physical gatherings in different formats and durations

Drivers/Enablers: Collapse of traditional systems. New collaboration formats and connecting technologies. Pressure to address societal challenges.

Barriers: Traditional Education. Passive Consumption Attitudes. Vested interests in today's paradigm

SOCIAL EXPERIMENTATION



Vision: Social innovation is becoming more recognised as highly relevant for developing innovative solutions addressing societal challenges. New modes of innovation are required to align social and technological innovation activities. Participatory experimentation will play a key role but what are the right instruments and levels required for successful solutioning?

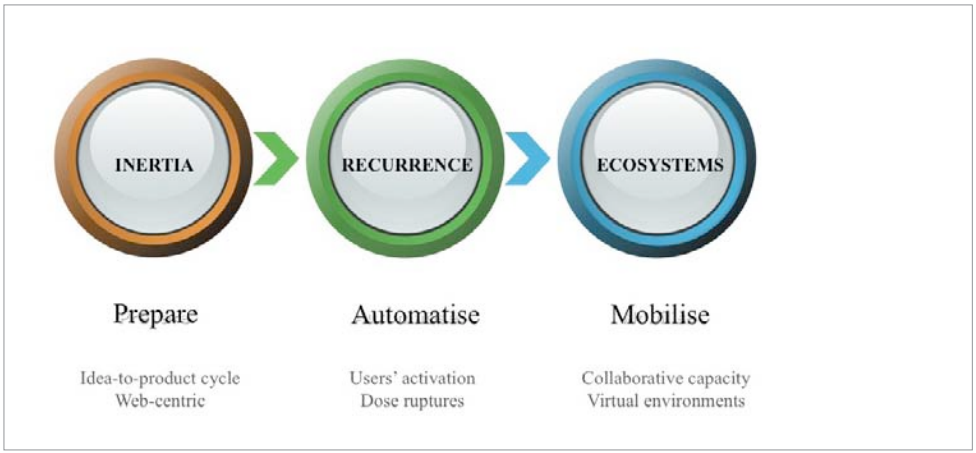
Key Features: New culture of innovation within a characterised by: Availability of flexible interdisciplinary professional structure functioning as "innovation mediator" aligning social and technological innovation through stakeholder dialogue. Operating on a meso-level embedded in infrastructure. Wide range of hybrid business models replacing producer/consumer duality. Participatory innovation as pillar of democracy

Drivers/Enablers: Need for context tailored solutions. Macro level change towards economy of contributions. Blurring of boundaries innovation,

production, usage stage. Need to define adequate level of participation.

Barriers: Abuse of participation for outsourcing of social services creates danger of participation fatigue and overload.

AUTOMATISED INNOVATION



Vision: A number of new techniques such as semantic web analysis allow for automatising parts of the innovation process from idea generation via design and testing. What are the implications for economy and society?

Key Features: Standardised processes leading from idea to product based on:

- Explication of tacit knowledge
- Standardisation and modularisation
- Evaluation procedures
- User Activation procedures

Drivers/Enablers: Immersive technologies and platforms. Adequate Business Models

Barriers: Inertia of organisational culture. Command and control management. Closed systems. Passive behaviours

WIDESPREAD CREATIVITY

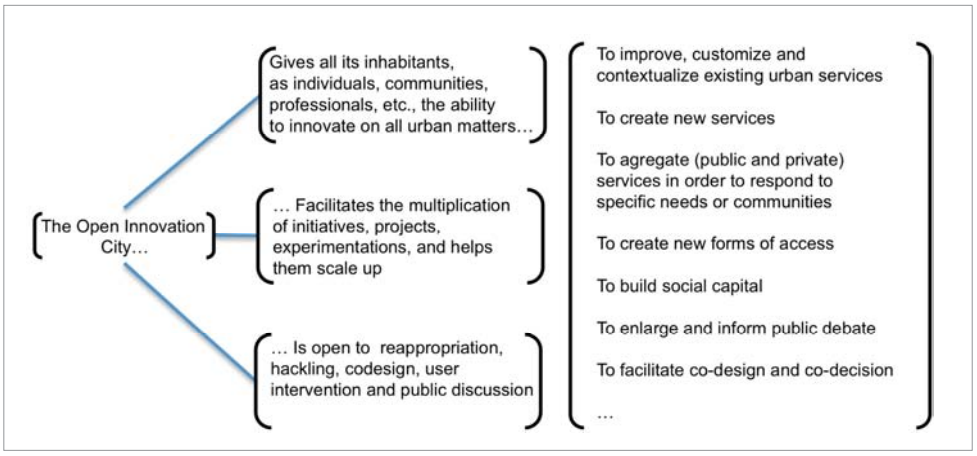
Vision: Innovation is becoming mandatory for more and more people in companies and other types of organisations. How can we avoid "innovation overload" and "innovation divide"? What does it mean to live in an environment that is constantly innovating?

Key Features: All actors in all value creation steps contribute creativity, no longer artists and designers only. Managers become facilitators. All professions recognised as "creative". High emphasis on relational innovation

Drivers/Enablers: Recognition of the role of Creative industries. Competition with low cost countries. EU Lisbon Strategy. Management theory and progressive businesses

Barriers: Widespread narrow understanding of innovation. Traditional education. Lack of resources. Fears of loosing control because of freedom required for creativity**.**

OPEN INNOVATION CITY



Vision: Cities are increasingly expected to play a major role as innovation drivers. In particular systemic sustainability innovations may best be implemented on a city level. What are adequate mechanisms for cities to reap the benefits of this potential?

Key Features: A city-level Innovation Ecosystem that:

- Enables all inhabitants to coproduce and enhance urban services
- Provides shared platforms, spaces and tools for experimentation including open data and fab-labs

Drivers/Enablers: Information platforms. Need for systemic and breakthrough innovation to address societal challenges

Barriers: Danger of unequal access and abuse. Lack of coordination may lead to suboptimal solutions. Lack of reliability and stability due to continuous experimentation

GLOBAL INNOVATION CHAIN INTEGRATION

Vision: Innovation is expected to become globally dispersed. But what will be the mechanisms to integrate all the distributed and diverse elements and to match ideas and solutions with problems and needs?

Key Features: Innovation is globally distributed and happens where it is needed. Innovation mindset and skills are widespread in particular among leaders. Actors with special skills facilitate coordination of innovation chain elements (rather than pure self-organisation).

Drivers/Enablers: Values and lifestyles (generation Y). Need to address societal challenges

Barriers: Lack of adequate mindset on leadership level - Lack of today's organisational capability - Lack of adequate education**.**

WASTE-BASED INNOVATION

Vision: The establishment of innovation patterns that are fully consistent with a circular flow of resources was unanimously assessed as top priority in the INFU experts' dialogue. However, many challenges are associated with this vision. How can novelties emerge out of used products, what kind of consumer types are associated with the pattern?

Key Features: Three basic paradigms: Access culture. Distributed network providing universal access to innovation knowledge and tools. Surplus ecosystem. A parallel social system that treats waste as resource. On demand economy. Waste is significantly reduced through producing only in accordance with demand

Drivers/Enablers: Crowd/sourcing- funding/creation - Changing values system - Decentralisation of knowledge - Hyperconnection - Depleting resources - Open source culture - Fab-labs (3D printing) - Cradle-to-cradle philosophy - Upcycling.

Barriers: Legacy Control Systems and mindsets - Legal hurdles - Complexity of existing material flows - Lack of necessary skills (e.g. re-designing)

Some selected Mini-Panel findings

Each INFU Mini-Panel vision is addressed distinctive phenomena, issues, and represented different stakeholder perspectives. Nevertheless, there were some common aspects that were prevalent across all mini-panel findings, which should be briefly summarised:

- Several visions are incorporating fundamental changes in the mediating mechanisms between innovation supply and demand. In most cases, the role of markets as dominant broker between needs and solutions is seen to be shrinking and more direct involvement individual or more often collective innovation users is described, which, for instance, coordinate with a network.
- The issue of defining adequate enabling platforms between innovation supply and demand for establishing these innovation support infrastructures is addressed in several visions.
- Most visions describe a change in the nature of the outcomes of innovation. Forming of identities and relations as well as social innovations are widely expected to gain relevance. Immaterial aspects of innovations are of growing importance.
- Most visions emphasise the need to address societal challenges and in particular environmental issues as key drivers of change not only for the target of innovation but also for innovation patterns.
- Innovation skills and creativity in particular are expected to spread from a few professions to the rest of society. However, in the process the very meaning of creativity seems to be changing towards a more everyday practice.
- In a number of visions, culture, values and lifestyles were recognised as key dimensions of change in innovation patterns. Moreover, the failure of today's education systems to support creativity and innovation skills is mentioned as a critical barrier in several visions.
- Fab-Labs and 3D printing facilities were mentioned in several visions as key facilitators of future innovation patterns.
- The need to find a balance between creativity and freedom on the one hand and structure on the other – which are both thought to be key for successful innovation – was highlighted during many expert debates.
- Some visions describe fundamental changes in the macroeconomic environment such as "economy of contributions", "on demand economy", "surplus ecosystem" "learning intensive economy".

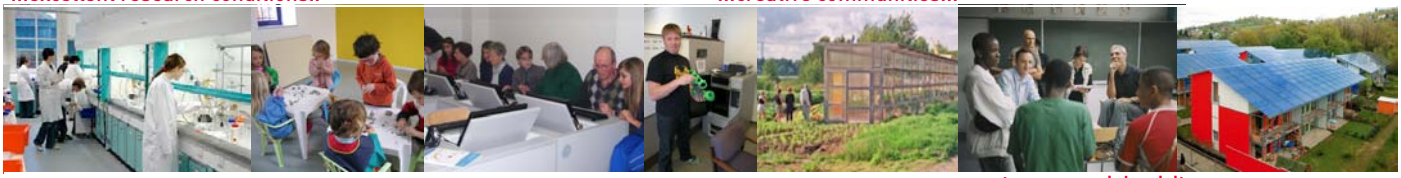
Unleashing the Creative Spirit, Europe Innovative Societies...

...cross-ages and disciplines...

...sustainable technologies...

...excellent research conditions..

...creative communities...



...new education models...

...fabbing for all...

...entrepreneurial spirit...

The Fallen Giant, European Innovation Fatigue...

...innovative businesses not anymore in Europe...

...less active universities...

..conservative public policies...

...ageing population slowing down...

...retirement postponed...

...living better consuming less...

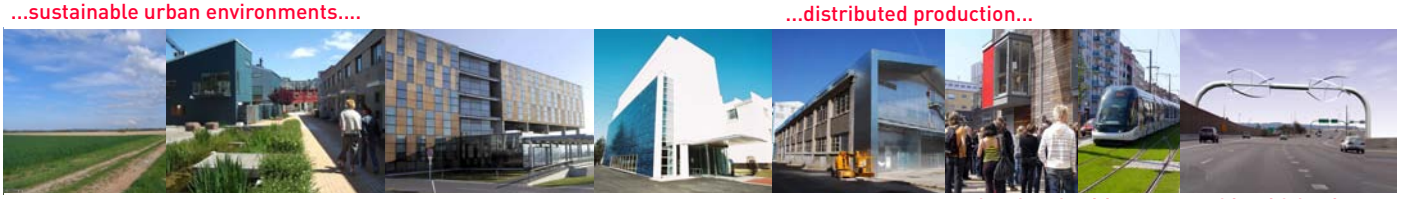
Locally Driven Innovation...

...local government as innovation facilitators...

...sustainable solutions development...

...sustainable urban environments....

...distributed production...



...attractive cities for creative class...

...city hall as headquarter for regional management...

...local authorities partnership with business...

Prometheus Unbound, Innovations for Innovation Sake...

...high-tech products race...

...generation clash...

...citizens innovation contests...

...technological clusters exploding...

...rapid fabrication malls...

...prosumer workshop...

...sustainability beyond economic imperative...

5 / Five scenarios for the development of the European innovation landscape

In order to discuss the likely development of certain innovation visions under different macro contexts, the bottom-up visions discussed above were met with different possible socio-economic framework conditions and global mega-trends.

The scenarios depict comprehensive, consistent, and plausible images of possible future European innovation landscapes. They portray the main actors, their societal environment, specific challenges, and implications for wealth creation, social cohesion and sustainable development. As a time horizon, we selected 2025, a year which is close enough to the present to make the scenarios relevant for today's decision-making, and yet far enough in the future to allow imaginable and probable changes in innovation patterns.

The scenarios build upon and are the outcome of past INFU work. Their main building-blocks are the key main factors, which shape and describe the future of innovation in Europe. The different future projections of these factors systematically map major uncertainties concerning future development of the framework conditions for innovation and new promising concepts of innovation.

The key factors were identified and selected in a collective and participatory process. At the heart of this process was a workshop involving both key participants from the mini-panels and further external innovation experts from all over Europe. During the workshop, visions and mini-panel findings were re-contextualised. Innovation patterns were placed within their economic and societal context. In particular, by relating the patterns to mega-trends such as environmental threats, demographic change, and globalisation. In addition, an environmental scan and mega-trend analysis was carried out followed by a feedback loop with the workshop participants.

Generally, key factors are characterised by i) high impact strength, and ii) high uncertainty about how they will develop in the future. The uncertainty of a key factor is expressed in alternative projections, each outlining a plausible development in the field of the key factor. For each, these alternative images of possible futures must be mutually exclusive and exhaustive, at least for the most probable and plausible evolutions of the key factor. The key factors and their projections give a

comprehensive overview about the imaginable horizon of Europe's future innovation landscape (see the Appendix for the full list of all key factors).

The key factors workshop had the tasks to:

- take stock of previous work: the signals of change, the visions and the outcomes of the mini-panels,
- identify and analyse key factors,
- develop future projections of the key factors for the time horizon 2025.

Overall, nine Key Factors (KF) were identified. They relate to three levels:

- The macro level of the global context with the key factors:
- "Global Innovation Centres",
- "Welfare and Growth Paradigm", and
- "Impact of Resource Scarcity and Environmental Problems"

The meso level of the European societal context with the key factors:

- "Societies' Innovation Capability",
- "Peoples' Involvement",
- "Mediators of Innovation", and
- "Sustainability and System Thinking"

The micro level of specific aspects of innovation processes with the key factors:

- "Crossover Innovation" and
- "Innovation Facilitating Technologies"

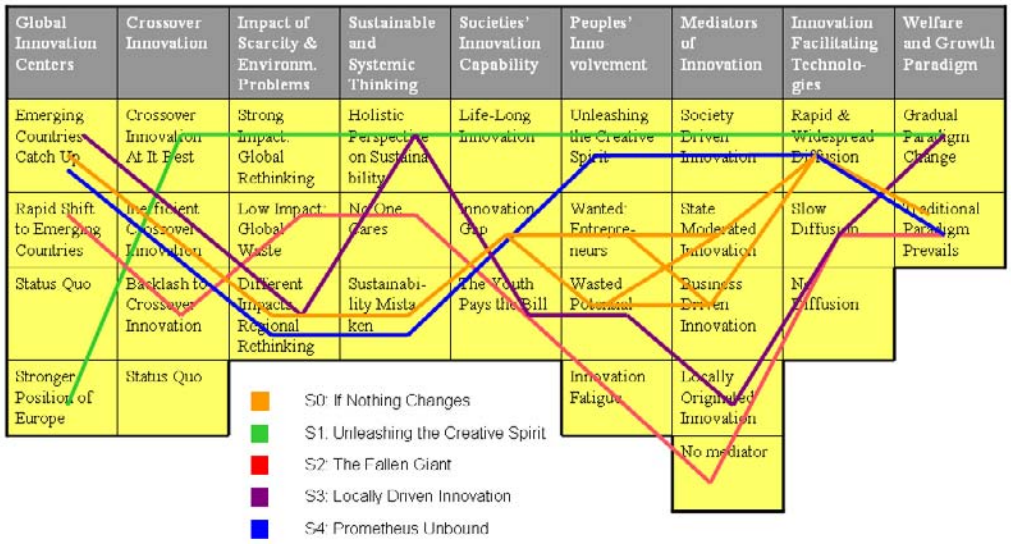
The main step in the construction of the scenarios was a workshop involving the INFU consortium team. During this workshop, the team identified and sketched a portfolio of scenarios for future European innovations landscapes based on the main uncertainties regarding the evolution of innovation in Europe. Scenario construction was supported by specific scenario software that supports the search for sets of projections with high overall consistency ("projection bundles").

Five scenarios were identified by combining different projections of the nine key factors with the purpose of building coherent and plausible pictures of the future.

These scenarios capture all-important future options for the European innovation landscape. Two on the more extreme side, as ideal rather than realistic options were added as "small scenarios" which one may describe as "scenarettos." The picture below displays the scenarios in the so-called morphological box. In the headers you find the key factor names, in the boxes below the projection names. Lines connect the projections belonging to a certain scenario.

The different future projections of these key factors systematically map relevant and possible alternative developments of the framework conditions for innovation and they include also new promising concepts of innovation. The illustration below shows the scenarios in the so-called "morphological box". The headers list

Figure: Key factors combinations for the scenarios



key factor names, the boxes below give the names of the respective projections. Lines connecting the projections belong to a specific scenario.

Methodology: Limitations and scope of scenarios

Scenarios are not forecasts. They do not describe "the future", rather, they depict consistent and plausible images of possible futures, of alternative future situations and the development path towards them: "This is how it could happen". They are based on a coherent and internally consistent set of assumptions about key relationships and driving forces. Which of these alternatives will be realised remains uncertain. Possibly, elements of all scenarios could materialise, perhaps to different degrees, or radically new aspects, i.e. elements of the future situation, will arise, such as new developments and trends, unpredictable innovations, impacts of disruptive events: "Something else entirely could happen." Thus, scenarios are not primarily intended to answer questions but their aim is to raise questions and to tell conceivable "stories" to inspire thinking about and debates on the future.

In the following the five scenarios are briefly introduced, which describe, the main characteristics and possible impacts of each[8].

8 *The full text of the scenarios is available in the Scenario Report (Del. 4.1), which can be downloaded from the INFU web page: www.innovaton-futures.org.*

5.1 / **Scenario 0: If Nothing Changes**

The baseline, or reference scenario shows an almost unaltered future as it pertains to present structures and innovation patterns. The challenges resulting from an ageing and shrinking population, global competition, environmental issues and resource scarcity are inadequately met. Ultimately, muddling-through politics lead to decline. In the global innovation race, the European Union falls behind.

This scenario is based on the assumption that key factors remain virtually unchanged. As there are major conflicts and interactions between these factors, the project team considered the scenario to be unlikely and providing of little insight.

Key Aspects of the European Innovation Landscape in 2025 in this scenario context:

- No major changes to innovation structures and patterns. The political and business communities rely on tried-and-tested models.
- Internal and external challenges are not successfully addressed, leading to a slow, comprehensive decline of the EU's capacity for innovation compared to other world regions.
- Innovation skill shortages and shrinking domestic markets lower the competitiveness of companies based in the EU. Europe is less and less valued as pilot market for new products.
- The societies' innovation potential remains largely untapped. Notwithstanding some "brain gains," fewer people are engaged in innovation, potentially due to aging and shrinking populations.
- Political support and funding are sufficient, but remain unable to boost the number of start-ups significantly. Entrepreneurs grumble about 'red tape' and other limiting factors.

5.2 / **Scenario 1: Unleashing the Creative Spirit. Europe's Innovative Societies**

In this scenario new forms of innovation such as waste-based innovation, open source innovation models, and the organisation of innovation camps involving many different people for a certain duration will flourish.

The scenario in a nutshell:

> By 2025, the European Union has become energised by a new spirit of creativity and has turned into the world's innovation centre. The EU is a main global innovation hotspot offering excellent research conditions

and providing the world with sustainable innovations, helping it cope with the grand challenges of our times. European societies have become a highly valued source for new product and service ideas, but above all for social innovation. In addition, sustainable business and consumption patterns have become the norm; economic growth and social welfare are no longer exclusively defined in monetary values.

Key Features of the European Innovation Landscape in 2025 in this scenario context:

- The European Union is one of the world's leading innovation regions, both for market-oriented and social innovations.
- European STI and RTD framework programs, as well as innovation, education and research policies are improved and efficiently organised.
- The innovation potential of the societies in the Union has been extensively activated: social communities and creative individuals are the main source for innovation.
- Innovation patterns have changed: innovation activities happen everywhere and people are tremendously willing and highly motivated to engage in creative activity.
- Systemic thinking: widespread consideration of closed loop models and cradle-to-cradle design in production and innovation processes.
- Gradual paradigm shift: Social welfare and economic growth are no longer exclusively measured in monetary values.
- Social innovations are highly regarded and create new patterns of living together, changing the overall cohesiveness of society.
- The grand challenges of the 21st century are fully addressed.
- Advancements in innovation technologies and tools, e.g. co-working facilities, collaboration tools and rapid/virtual prototyping technologies.
- Widespread and intensive use of innovation facilitating technologies on- and off-the job, such as virtual prototyping, fab labs, augmented reality and other technologies.

What are the possible positive and negative impacts of this scenario? On the positive side, one may expect that European societies benefit from high educational standards. Social and environmental aspects are considered and all relevant stakeholders are fully integrated into innovation processes. In addition, social welfare is on an exceptionally high level and researchers have access to superb research conditions and excellently equipped research infrastructures. Favourable framework conditions for entrepreneurs. Very low administrative barriers and widespread presence of private and public

innovation spaces exists there as well.

A possible negative effect of this scenario is that the competitiveness of European companies decrease as they fail to open their processes to external innovation sources and stick to unsustainable manufacturing. The potential abuse of freely available content and widespread creative commons licenses are other scenarios.

5.3 / **Scenario 2: The Exhausted Giant: European Innovation Fatigue**

The scenario in a nutshell:

> Demographic aging, inadequate policy responses, high levels of competitive pressure from other extremely innovative world regions, and a certain "innovation fatigue" of its population cause the European Union to lose most of its innovation capacity by 2025. Faced with this situation, policymakers, and entrepreneurs stick to obsolete models of growth and welfare, education and innovation. The few remaining innovation activities are exclusively business-driven and not embedded in systematic approaches to sustainable development.

Key Aspects of the European Innovation Landscape in 2025 in this scenario context:

- Inefficient education systems: shortages of qualified personnel and creative workforce become more severe, and the number of people working in creative industries drops.
- Brain drain: the EU has little to offer as a location of innovation for highly-skilled foreign experts.
- Closed innovation: most innovation activities in companies take place in isolated R&D departments that exclude customers and other stakeholders.
- Social innovations remain the exception: too much administrative red tape and too few people with enthusiasm for and commitment to innovation.
- Very low and poorly coordinated public support of research: lack of appropriate innovation framework programs to improve international cooperation, links between academic and commercial sectors, and knowledge production in R&D .
- Innovation fatigue: very low demand for new products and services as well as very low motivation of people to engage in innovation projects.

Social initiatives and individually driven innovation projects are almost non-existent.

- Only small-scale and inefficient use of technologies facilitating new innovation, primarily the province of major companies and highly specialised research institutions.
- Few efforts towards sustainable development in politics, business and society.

Automated innovation and "no-innovation" as discussed above become more important in this scenario context.

The positive and negative impacts of this scenario: The highly competitive strength of globally operating European companies that relocated R&D departments and other critical business units to "emerging" countries such as Asian and Latin American regions at an early stage can be considered as a positive impact of this scenario. However, i) the deterioration of Europe's economic situation and declining welfare spending, ii) lack of appropriate framework conditions and opportunities for young creative people (who leave the European Union in ever greater numbers), iii) grim outlook for researchers, teachers, and professional coaches as research budgets shrink, and iv) unfavourable conditions for citizens with ideas for social innovations who face risk-averse social environments reluctant to innovate are on the negative side of this scenario.

In this scenario context we can also imagine a specific scenaretto as we mentioned earlier "When the Race Is Over," at which point we envisage that innovation has lost its positive connotation and is more regarded as an undesired burden, something unnecessarily disruptive to society. Companies feel that they are better off when they limit the number of people involved in their innovation processes and voluntarily abandon all attempts that aim at the opposite. Surely, products are less innovative and less "cutting edge" as in former times, but they are of a higher quality, last longer, have real usage and emotional value for their owners and user.

5.4 / **Scenario 3: Locally-Driven Innovation**

The scenario in a nutshell:

> In 2025, Europe's innovation landscape has changed significantly. Cities, agglomerations, and regional governments have replaced European or national bodies as the most important mediators and facilitators of innovation. They made up for the lack of national and EU guidance and the entrepreneurs' growing reluctance to innovate. Thanks to local citizen initiatives, Europe's innovation capacity has returned to a high level while companies play only a moderate role in pushing innovations. In 2025, innovation is realised and organised at the local micro level and provides solutions mainly, but not only, for urban challenges.

Key Aspects of the European Innovation Landscape in 2025 in this scenario context:

- The importance of cities and regions as efficient mediators of innovations is fully recognised within the Unions' innovation framework.
- Higher importance of local innovation initiatives within European innovation policy. There are only a few top-level innovation guidelines.
- Role and structures of cities and regions have evolved. Open knowledge cities are the most important innovation enablers and employ the best creative heads.
- Participatory innovation: citizens and all other urban stakeholders are empowered and directly involved in innovation processes.
- Europe is characterised by a large number of new social innovations. Most social, economical and ecological challenges are addressed at the local level.
- Shortened decision-making chains: businesses and entrepreneurs have easy access to innovation funding and support.
- Neighbourhoods and councils have free access to public data and co-developing places which in return makes it easier to diagnose urban challenges more accurately.
- Thanks to local initiatives, the European Union is able to compete with other regions. European cities serve as role model for a sustainable development.

Referring to the innovation visions, city-driven systemic innovation and social experimentation are innovation visions which in particular will become mainstream under this scenario.

In this scenario local governments and local communities have more decision-making freedom and are able to design their innovation strategy based on

local needs and conditions. In addition, affected citizens profit from effective working solutions and social cohesion improvements due to high degree of collaboration between citizens. Successful social innovation projects provide new stimuli to other cities and regions with similar problems. These are all positive impacts we can think about when debating this future. Unfavourable frameworks for supporters of a centrally organised European-wide innovation strategy or common innovation landscape are, amongst others, problematic aspects of this scenario, along with the risk of partly inefficient duplication of efforts or the inability to realize large-scale projects.

5.5 / **Scenario 4: Prometheus Unbound: Innovations for Innovation's Sake**

The scenario in a nutshell:

> Europe has set the course for innovation and competitiveness. All major actors – from commerce, politics, and society as such – collaborate to open and streamline innovation processes, overhaul rigid administrative systems and promote innovation at every level, financially, and by providing good framework conditions. Europeans are highly motivated to contribute ideas. However, since innovations are guided mostly by an economic rationale, environmental problems are not addressed in a comprehensive and effective manner. Moreover, parts of the population drop out of this fast-paced lifestyle.

Key Aspects of the European Innovation Landscape in 2025 in this scenario context:

- Strong focus on economic growth and innovation. Overall, Europe retains its competitiveness compared to other regions.
- Optimal conditions for people to engage in innovation projects and processes: inside and outside companies.
- Open innovation: Users and communities are important sources of innovation. They are often integrated into both public and private R&D processes.
- Best available technologies: Innovation facilitating technologies are in widespread use. High degrees of information flows and open structures are present.
- Economic success and the imperative to innovate come with some severe drawbacks.
- Increasing innovation gaps: education systems hardly focus on life-long learning and fostering the innovation-related knowledge of older

generations. More people feel left behind and are unable to keep up.

- Only moderate awareness of sustainable development: solely isolated and technology-based measures to improve environmental sustainability of business activities. No change towards sustainable consumption patterns.
- Only few new social innovations, most being market-oriented.

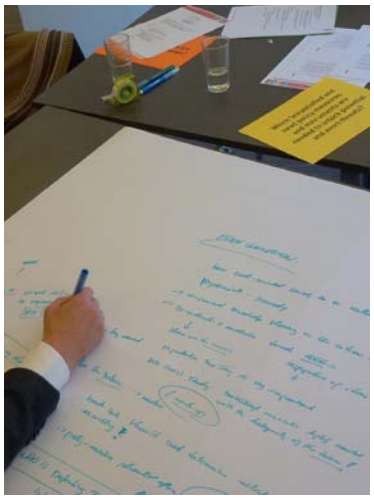
The wide diffusion of open source models, the organisation of innovation camps and laboratory stores are all new forms of innovation (innovation visions), which are particularly relevant in the context of this scenario.

Which positive impacts are related to this vision? We can think about increasing business opportunities and sales potential for European companies with high innovation rates. In addition, innovative people, in particular the younger generations, may find excellent conditions for sharing and developing ideas.

Regarding negative effects, firstly, there are increasing business risks for small and medium-sized companies with insufficient capacities for generating high numbers of innovative products and services in the merciless and high-speed innovation race. Secondly, those who are not willing or able to follow the omnipresent innovation pressure are increasingly suspended and society may drift apart. And thirdly, more negative environmental impacts can be expected due to shorter product cycles and as the waste of resources continues and awareness of CO2 emissions remains insufficient.

Within this scenario context one may also imaging a further variant (scenaretto), which can be described as "Closed and Gated Innovation". We may see a development where many companies learned the slogan "open innovation" the hard way. Most Eurostoxx companies experimented for a while with opening up their innovation silos, with inviting citizens – and their ideas! – into corporate invention, research and development processes, making much marketing ado around "user designed products." In the end, dissipation of intellectual property hurt too much. Asian competitors quickly learned to sneak into innovation processes, and often were first on the global market with products developed in Europe. European IP initiatives did not really help combat industrial espionage, and the prosecution of infringements was slow and inefficient. Thus companies closed their gates. Moreover, the public innovation labs and creativity parks, established during the "innovative tens," applied the same "date protection" rules as private companies. Innovation did not dry up. Perhaps it is even more valued as before, and any real or would-be innovator can claim to be a "bearer of secrets." However, innovation lost much of its social charm and got a distinctly commercial character.


Innovation Future -
Creative Spirit




The perception of
creativity will change
The very meaning of innovation may
be shifting. Creativity may become
a key aspect in all professions.

6 / Eight Dimension of Change in Innovation: Opportunities, Threats and Implications

In the final stage of the INFU project, we assessed visions and scenarios and discussed implications for policy and companies. The assessment is based on insights from the INFU visioning and scenario building activities along with two assessment workshops. A specific assessment workshop took place in Karlsruhe on 23rd of May 2011. A world-cafe setting was used to assess the negative and positive implications of these innovation patterns with experts from industry, policy and academia. Another workshop took place in Marseilles on 7th of July 2011 in the context of the LIFT conference. In this workshop, selected challenges arising from the INFU insights were assessed in small working groups and later presented to the plenary. In December 2011, a specific workshop to discuss implications for policy was organised with representatives from different General Directions from the European Commission, the OECD, and Member States. In addition to running these three workshops, the INFU team conducted a number of interviews with policy makers and company managers to discuss and elaborate upon specific conclusions.

For the assessment and discussion of implications, eight dimensions of change have been synthesised. These dimensions of change (not fully independent) are common pat-terns and the underlying features of innovation visions from the INFU project and a link to the scenarios developed. We will firstly give an overview of these dimensions and then present some selected risks and opportunities of each dimension, and discussing implications for policy and business.

6.1 / Eight dimensions of change: An Overview

The INFU foresight exercise on future innovation landscapes has pointed towards the following relevant dimensions of change in innovation patterns:

- 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.
- Participation: Citizens and customers seem to play a more relevant role in innovation, both in deciding upon and contributing to innovation priorities and processes. Finding the right level and instruments that enable this kind of collective problem solving appears to be a crucial future challenge.

- Motivation: The motivation for innovation is changing. Company profit as the main driver of innovation activity is being augmented. Solving societal problems is also 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 ideas competitions) for their pleasure.
- Automatisation: Software will play an ever-increasing role in innovation. More innovation steps may become automatised (e.g. by using a web crawler to identify ideas).
- Infrastructures: New innovation enabling infrastructures will emerge alongside new innovation formats. In particular, enabling infrastructures for community innovation like innovation camps, shared fab-labs and co-working spaces are likely to become more important. Virtual and digital global innovation infrastructures may be increasingly required.
- Perception of creativity: The very meaning of being innovative is shifting. Creativity may become a key aspect in professional activities. Formation of identities and social relations alongside everyday creativity may increasingly be recognised as core aspects of innovation.
- Spatial shifts: Innovation will change its spatial patterns. Local elements are likely to gain relevance, resulting in more distributed innovation scenery. At the same time, new regions emerge as key actors in global innovation chains.
- Systemic sustainability Innovation: In order to address the grand challenges, innovation patterns fostering system transitions towards sustainability rather than isolated product development become more important. This requires considerations of social and ecological criteria during the entire innovation process. For example, by designing circular resource flows based on the cradle-to-cradle philosophy.

We will summarise opportunities and risks (assessment) along the eight dimensions of change and discuss implications for policy and business in the next section. The development of policy conclusions is guided by the idea that policy should exploit and unfold opportunities of new innovation models on the one hand, and avoid risks and negative impacts on the other.

6.2 / **Mediation and Coordination: Markets and what else?**

Several new innovation patterns challenge the position of monetary-based market mechanisms as the main mediator between innovation demand and supply. We can observe new mediation mechanisms such as self-organised communities, web-based co-design platforms, or innovation initiatives on the city level involving public and private actors that all operate with different "currencies."

6.2.1 / **Assessment**

Some of the most significant opportunities are:

- If we are able to harness the 'wisdom of the crowd' a greater number of high-quality ideas become available.
- A new 'constructive power of coordination' (enabled through charismatic leadership) may be emerging.
- There is a high potential for new business opportunities to arise from providing services and products around the aforementioned new innovation patterns.
- Some of today's barriers to profit-oriented product innovation will disappear. Traditional economic "power structures" may erode due to easy transfer of solutions and absence of patenting.
- The open source society will offer new opportunities for start-up companies, requiring less start-up capital.

Major threats concerning this development are:

- In addition to a lack of standardisation and legislation, society may suffer from an overload of ideas without adequate mechanisms to process, filter and implement them. A permanent state of experimentation may induce an ever-changing / never working system, which is especially challenging for the elderly.
- Companies externalising the risks connected with innovations resulting from open innovation approaches may not compensate the innovators sufficiently. This might lead to the emergence of a "creative poor".
- Resistance to these new forms of mediation may emerge from inside the companies if employees feel challenged by new external forms of innovation.
- There are too many policy levels and local structures supporting innovation, competing more than collaborating, and reducing efficiency and readability of the support resources.
- Companies may not be able to exploit these opportunities due to a lack of required competences. In particular, many companies lack the cultural

competencies to interact with the actors of these new formats and do not have the "currency" required to act in these types of markets.

6.2.2 / **Implications for policy**

At the policy level, the emergence of new mediation mechanisms require a policy that takes a leading part in making new forms and patterns of innovations more visible and eligible for funding as well. Accordingly, there is the need for more coordination between different policies and policy levels along with efficient and effective governance (multi-level governance). This holds especially true when we call for more systemic innovations. Policy coordination must be enforced and aligned with various instruments from different policy realms. Therefore, a new form of system-integrator for systemic innovations is required and non-engineering, non-natural science competencies from the humanities should be included in the innovation process. At the regional and urban level, policy has to consider whether or not to play a much more active role as a proactive mediator.

Policy should enable all actors to participate and avoid exclusion. In addition, policy should initiate projects with new formats involving very different actors from many realms. For example, if individuals (laymen, citizens, users) or groups of individuals organise themselves into innovation camps and become eligible for funding, new target groups for RTI policy come into focus. Existing policy measures that address innovation management and coordination activities via projects, advice, services and platforms would receive new focus and spin. It would also become more complicated if companies and individuals were eligible for the same funding.

This change in the innovation actor landscape and the forms of interaction surrounding innovation activities also poses challenges to existing forms of regulation. When innovation also comes from individuals and not just from companies, rules and norms about the ownership of innovation (Intellectual Property Rights - IPR) and product liability must be further developed and adapted. Additionally, it is necessary to find solutions and norms for a fair distribution of profits between organisations and individuals (e.g. crowdsourcing), which at the same time does not crowd out motivation (see also dimension 3). Policy therefore should help to establish clear and transparent rules for these types of new markets including compensation rules, IPR and liability issues in a similar way as for other types of transfer markets. Several examples such as creative commons, copyleft, and the

flexible purpose corporation[9] are new trends that can be mentioned in this context.[10]

6.2.3 / **Implication for companies**

New mediation mechanisms offer both threats and opportunities for companies. Realising new opportunities requires a better understanding of the behaviour and roles of new actors external to companies but occasionally from within. Companies should understand the rules of new mediation forms such as platforms, virtual communities, citizens' communities, etc. There is the risk that companies will not be able to exploit these opportunities due to a lack of competency required due to the limitations of their respective corporate cultures. Ideally, large companies should monitor development regarding new ways to organise the innovation process and define strategies for how to respond to new situations.

Traditional industries, for instance, can learn from the software industry and how established software companies responded to the open source software development trend. Typical business strategies involve offering services such as training or the development of tools that enables the development of products within a community (e.g. user toolkits) or the establishment of an online platform.

We have identified many signals and models for organising innovation in a new way, which are related to the Business-to-Customer field. However, the strategies have potential for the Business-to-Business sector as well as internal use within organisations (e.g. communities within an organisation to develop new ideas, innovation contests).

Companies can benefit from the new innovation models, i) if they adapt their organisational structures, especially where traditional power structures

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9 *A Californian law from 2011 allows a corporation to integrate the for-profit philosophy of the traditional corporation with a special purpose mission that is similar to a charitable purpose*

10 *Of interest in this context are also the findings from the EPO scenario exercise, which was conducted in 2007. This report (EPO 2007) clearly reveals that it is very likely that the current patent system will change considerable in the future. The scenarios developed by an expert team vary considerable ranging from envisioning a future where large multinational still drive the patent system and build up powerful patent portfolio on the one hand to a future where we see a gradual erosion of the patent regime due to diminishing social trust and growing criticism of the patent system. In the foreword of the "World Intellectual Property Report - The Changing Face of Innovation" Francis Gurry, the General Director of the World Intellectual Property Organization (WIPO) argues that the face of innovation and therefore also the role of intellectual property (IP) has significantly changed over the last decades. He finds that the importance of IP as a topic has increased. The WIPO expects a growing demand for IP protection on the global level because of a worldwide increased focus on knowledge, the rise of new innovating countries and the desire to protect inventions.*

in innovation processes are concerned, ii) if they find adequate methods to assess and filter ideas generated by crowd-sourcing with respect to existing or new business models, and iii) if they find ways to handle IPR questions arising from the new innovation models and install corresponding remuneration procedures.

6.3 / **Participation: What is the right level of involvement?**

Citizens seem to be playing a more relevant role in innovation, both in deciding on priorities and in contributing to the process.

6.3.1 / **Assessment**

Some of the most significant opportunities are:

- Radically open, participatory innovation landscapes allowing the empowerment of citizens, employees and customers, in order to foster creativity and idea generation. Radical innovations will be encouraged, as people are ready to take bolder risks.
- Direct feedback of participation through local implementation and closed loops between projects and benefits will be rewarding to all actors. Mobilisation of the critical mass of stakeholders may enable finding breakthrough systemic solutions to societal challenges.
- Opening up innovation patterns towards contributions and assessments from many actors improves the context-specific relevance of innovations and assessment of ecological soundness. Rebound effects are reduced through close interaction between innovation promoters and opinion leaders.
- Changing the role of policy-makers from "decision-maker" towards participation facilitator, moderator and stimulator may foster politics oriented more towards problem solving.
- Avoidance of strong social conflicts on technological development (i.e. genetically modified organisms, nanotechnology, etc...) that may occur if citizens are not involved in the deliberations of research and technology.

At the same time, we may observe some threats, amongst them are:

- Participatory processes might hinder long-term transitions towards a more sustainable ecosystem because the majority of society do not tend to accept negative short-term effects at an individual level (slogans such as nimby ("Not in my backyard") and banana ("build absolutely nothing anywhere near anybody") indicate this development). Society may become locked into its current status.
- Many requests for time-consuming participation in innovation processes

and heavy responsibility may result in a participation fatigue, which makes it increasingly difficult to involve people.

- Discrimination may occur in the form of small elites with the time, attitudes and resources available to participate at odds with the rest of the population.
- Pseudo involvement may emerge, which leads to only superficial adjustments whereas the true power mechanisms are hidden behind a "participatory facade" Such participation for its own sake leads to participation fatigue in the long run.
- 'Longish' participation processes may result in innovation dynamics slowing down.
- 'Longish' participation processes may result in innovation dynamics slowing down.
- For export-oriented companies that become heavily involved in participatory innovation in home markets, there is a danger myopia and having only local perceptions that lead to Eurocentrism and a failure to address the demands of global markets.
- If society at large becomes more participatory, many companies will experience major problems. As many of them are still very much operating in a "command and control mode" themselves, they will not be able to deal with demands from customers and employees raised in a participatory society.

6.3.2 / **Implications for policy**

Policy may need to focus on the enabling framework for the four pillars of the innovation system (quadruple helix[11]): 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 (e.g. Facebook, Twitter) should be developed, tested and deployed. Normative and exploratory forward-looking activities where actors jointly develop shared visions and debate values.

11 *Involving civil society as important actor in the innovation process has been described as quadruple helix approach (Arnkil et al. 2010) referring and extending the well-known triple-helix approach from Etzkowitz and Leydesdorff (2000).*

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 a lack of long-term orientation on the part of today's actors.

Nevertheless, there is no "one-size-fits-all" participation mode. Participation procedures need to be tailored to different phases of the policy process, such as: idea generation, visioning, up-scaling, co-production of solutions, political involvement, and funding through citizens. Also, the right scale for participation needs to be carefully adapted. Not everybody can be an expert in everything and too many requests for contribution will lead to overload, fatigue or may slow down the process.

If adequate instruments were available, perhaps citizen activities such as protests could be channelled into joint problem-solving projects. Different actors should be supported in finding participatory solutions. Both large and small companies need to build up respective competencies. Policies should support SMEs moving towards collaboration and sharing innovation equipment; regulatory frameworks should create a safe environment for co-inventing and developing.

Innovation policy should consider funding more heterogeneous consortia with "lay people"/users in leading roles, as well as new formats such as cross-cultural innovation camps and user research to define societal needs as the first step instead of the last.

6.3.3 / **Implications for companies**

Participatory and distributed innovation models are on the rise, and shorter product life cycles require increasingly open innovation strategies. However, with respect to the opening of the innovation process and the involvement of different actors, companies should find:

Companies still have to develop and protect their core competencies. Similarly, the legal responsibility for innovative products and services still remains with the company. In this context, companies have to develop criteria and rules for when to chose more open or closed innovation strategies. Highly open innovation processes are more difficult to control and some companies (e.g. Nike with the request of a customer to print 'Sweatshop' on a shoe) have gained difficult experiences when opening the innovation process and involving customers to design their own products.

In addition, knowledge sharing and joint development of innovations requires a clear strategy for how the knowledge generated is shared and/or protected (IPR), for there is the danger of knowledge drain.

The initiations and governance of highly participatory processes is challenging for companies, and is a learning process that requires trust

of self-organisational mechanisms. However, such mechanisms can be controlled in a traditional hierarchical way. Thus, (top) management has to create the conditions and capacities to manage innovation, its role so to set the right conditions for innovation to strive in a given organisation.

Companies have to motivate managers and employees to go outside (open innovation) and to exploit the opportunities. Still, there are considerable barriers for opening the innovation process (e.g. problem of "not invented here" if solutions come from outside the company). At the same time, there is the risk that companies are focusing too much on customers (e.g. Henry Ford claimed that when he asked potential customers what they wanted, they answered that they would like faster horse carriages). However, the idea of wide level of participation has also be adopted within the company and contests, competitions and similar methods may be used within the company to engage and motivate the entire workforce.

Companies have to find the proper level of participation, as too much and wide participation may slow down the innovation process or lead to lukewarm solutions (the "too many cooks spoil the broth" problem). Because there are different ways for how participation can be organised, companies have to find the right format of participation (workshops, panels, crowdsourcing, etc.) for the given problem. Participation of potential users / customers may help to avoid insufficient acceptance or outright rejection of an innovative product or service. Success depends however on the identification of the appropriate target group / stakeholders for participation. It makes a big difference whether one is aiming at incremental innovations or revolutionary, disruptive ones.

6.4 / **Motivation: Innovation for profits or social benefit?**

The motivation of organisations and individuals to develop innovation is changing. The main driver of innovation is no longer just company profit. Solving social problems becomes an important driving force to innovate, for both companies and individuals. In addition, individuals are motivated to contribute to innovation activities through mechanisms such as crowdsourcing initiatives or idea competitions for their pleasure.

6.4.1 / **Assessment**

Some of the most significant opportunities are:

- Changing motivation allows developing solutions, which ultimately improve the quality of life.
- Value-driven innovation gives answers to major societal challenges.

- Services with attributes such as 'social' and 'caring' will no longer be regarded as trivial and become attractive activities.
- The connection to social values prevents the attitude of indifference, which allows following the slogan "hold the world in your own hand".
- New resources to finance the innovation system emerge that reduce risks.
- Strong motivation to solve social problems may overcome the time gap between the short-term losses and long-term gains of sustainability innovations.

At the same time, we can also observe threats, amongst them are:

- Companies that are now very much focused on product innovation may experience problems in generating profits, as traditional product innovations will be less accepted.
- Changing motivation patterns increase the demand and complexity of policy coordination, as completely new policy realms such as social policy need to be involved in innovation policy-making.
- Changing motivation patterns may decrease economic wealth and growth, as the outcomes of value-driven innovation will create a different kind of wealth (e.g. time). Simultaneously, shareholder expectations cannot be adjusted to less than 10% annual growth in turnover. Accordingly, conflicts between innovation actors will emerge.
- Resources for innovation policy may become contested as society may question the spending of taxpayer money on research if there is no immediately obvious social benefit.

6.4.2 / **Implications for Policy**

New motivations require new and alternative solutions in different socio-economic realms. As such, there is a call for different forms of innovation (e.g. tangible and non-tangible, social and organisational) that addresses several individual and societal needs and challenges. This also leads to the need for policy innovation and coordination, aiming to include different sector policies together with innovation policy matters. Needs and demand for innovation in the sector, and the sectoral innovation agenda could be defined and conducted by sector policy experts and coordinated via a systematic innovation policy framework.

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 that are often based upon participatory processes and user involvement. Therefore, participatory processes involving policy-makers, citizens, users and laypersons should be

eligible for funding to a larger extent than currently possible.

Additionally, 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.

Shifts of motivation towards societal needs also have consequences for demand-side innovation policies which become more important in this context as they can address specific societal challenges. Against this background, such policies should enable first use, e.g. through subsidies for both the company promoting the innovation and a potential client that is willing to install and test the innovation and to demonstrate it to other potential clients. In addition, policy should integrate technical and social science research along with innovation (both are weighted equally). However, stakeholders should be involved to an extent beyond superficial consultation and dialogue processes with citizens. The creation of linkages between different projects that fit and contribute to overall societal needs should be given adequate justice.

Non-commercial and social innovations together with changing motivation patterns also need new measurements and indicators, but also evaluation criteria and methods. The impact of innovations is not just economic growth, but things like changes in quality of life and well-being. Thus, non-monetary remuneration for innovation activities is required to validate such new forms of motivation and innovation. At the same time, motivation patterns to innovate may also require a fair share of gained profits (monetary and non-monetary) to keep individuals motivated. This goes hand in hand with the upcoming change in growth paradigm and the measurement of wealth progress (more focus on life quality and not just increases in the numbers of innovations).

In this context, policy for social innovation and social entrepreneurship should be strengthened. Such companies have proved to be "profitable" in monetary and non-monetary terms.[12] However, we still have to better understand how to support social innovation, entrepreneurship, and its relation to traditional entrepreneurial activities that are mainly driven by seeking profits.

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

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12 See for instance the findings of the EU funded SELUSI project, www.selusi.eu.

6.4.3 / **Implications for companies**

A wide range of new innovation models offers ways to organise innovation and use the creative talent of different actors in the innovation system. There are many opportunities to be innovative in the true Schumpeterian sense (= commercialisation of ideas).

A number of newly emerging innovation patterns are hybrid in several respects. They are situated across classical economic sectors, actor arenas and policy realms. They function according to a different logic than classical business-driven technological innovations. Accordingly, they require a new type of enabling infrastructure, which provides a secure and stable environment for experimentation. It seems worthwhile for future oriented innovation management and policy strategies to explore the specificities of the hybrid innovation infrastructure such as the "Innovation Campsite." Fab-Labs, or similar flexible manufacturing equipment, could be a prominent feature of this infrastructure.

Companies must develop new business models (hybrid) that consider the interest of citizens and the intrinsic motivations of users. In this respect, we can expect that market will emerge created by social entrepreneurs. In the long run, this creates new markets (premium markets and further improved markets (differentiated markets). The negative aspect could be that the market diminishes, as the customers have no willingness to pay for services. Finally, the acquisition of social enterprises is one strategy that may become more feasible in the future. Even if the companies are not profitable, the acquisition of such companies might enhance the image, spill-overs, and the like.

6.5 / **The use of information and communication technologies: To which degree can innovation be automatised?**

Software will play an ever-increasing role in innovation. More of the steps in innovation may become automatised, such as by using a web crawler to identify ideas, using simulation algorithms to generate ideas to assess the market potentials of ideas, and to consider systemic implications, including environmental effects.

6.5.1 / **Assessment**

Some of the opportunities are that:

- Automatised innovation processes may not only support individual employees by reducing the pressure to be creative, but also by setting free capacity for radical innovations.

- Algorithm-based innovation may underpin the handling of complexity and thereby support a transition towards improvements in society as a whole. With automatised innovation processes, it may become possible to map the unknown and better meet consumer needs and preferences.
- With the increasing use of algorithms and web-based innovation elements, the innovation process becomes faster and more efficient and effective. Fewer resources are required to produce new products and services and the merging of different fields can enable breakthroughs and thereby speed up the innovation process. Improved testing facilities will prevent failures.
- The dematerialisation of products and the transfer of innovation algorithms may bring about new business models for start-up companies.
- Increasing use of powerful algorithms allows complex systems to be more accurately assessed. Automatised innovation procedures will enable the exploitation of the vast amount of data created in the Internet.

Associated threats are[13]:

- A specific risk not only of automatised innovation but also of open innovation elements is data security and reliability. Criminal actors may threaten privacy and manipulate virtual systems by generating false preferences leading to negative effects in society and reduce product quality. Privacy concerns may lead to information hiding and closure.
- Artificial intelligence needs to be controlled when values are involved and when it is closely connected to systems with significant impacts. Otherwise the damage resulting from system failures is too high.
- Superior knowledge of a few information technology experts may lead to a concentration of power and subsequent division of society. Job opportunities for the 'educated' and 'medium-creative' people may shrink as a consequence.
- Algorithm-based innovation may lead to a lack of diversity in innovation.

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13 Although the intense use of ICT enables new innovation patterns and often speeds up the process, the long-term impact on the innovativeness is hardly ever addressed in the literature. Francisco (2010) is amongst those authors who have a very critical perspective on the widespread diffusion and use of ICT in innovation processes. His critics relates to the automatised innovation vision mentioned before which even proposes and may lead to a development where innovations are only just consumed virtually on the web. Such develop-ments, in turn, may weaken the innovative outcomes of industry in the long run. He claims that skills and the changing socio-spatial and cultural context to produce innovations is eroding slowly. Francisco (2010) de-scribes a negative feedback loop which he labels as 'Innovation Paradox' and argues very critically, 'The more we innovate in our current fashion, the more we disconnect ourselves from the human experiences, behaviours, and values that constitute the roots of innovation as we know it'.

Consumers are locked in a bubble that is defined by their initial preferences. This is because information supply is automatically customised to their assumed preferences.

- Securing high quality input for the algorithms will be difficult (garbage in, garbage out). Reflection and creativity will be reduced if automatised innovation patterns become dominant.
- Speeding up the innovation process combined with the ease of copying software algorithms may lead to difficulties in protecting intellectual property rights in a globalised world.
- Software-based innovation patterns, in particular, when directly coupled with production or financing systems may bring about an economy with unlimited generation of ever new products at (risk of creating « 8 million customised unicorns »). At the same time, radical systemic innovations may be hampered, as automatised solutions will foster a preference for easy solutions.

6.5.2 / **Implications for Policy**

The automatisation of (parts of) the innovation and idea generation process (already) requires a systematic and automatised search for new ideas in digital sources and therefore a large amount of data processing.

Companies searching for valuable data through tools such as web crawlers, use this data in the innovation process. Quite often, citizens, other companies, organisations and consumers are not aware that their individual data is used and further processed for business and commercial reasons. Misuse of personal data becomes an issue and a risk.

Against this background, a public debate and campaign could be initiated which reflects upon the role and positioning of the individual in the information society. At the same time the debate could help individuals position themselves in the digital reality as mature users and data providers. This debate has already started and can lead to guiding principles about data rights and processing that will become increasingly important to our societies. Only informed and mature consumers can deliberately avoid being "locked in a bubble" which is defined by their initial preferences. This effect can occur when extensively customised information based on simulation algorithms, is provided to the customer for commercial reasons only.

With respect to the automatisation 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 could guide and define IPR (owning and licensing the data), user rights and transparency of the data, as well as the (fair) share of profit and value created with the data. Content policy (content provider versus content user), interoperability and standardisation issues to prevent monopolisation of data processing and storage should become issues of ever growing importance.

An open source strategy for specific data could support the successful handling of systemic complexity and thereby strengthen the transition towards improvements in society as a whole. 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.

Policy actors will be asked to seek a balance between ensuring data security and transparency for individuals and organisations on the one hand, and enable more efficient and faster innovation processes by using simulation algorithms on the other. Thereby, evaluations of the effects of new products on society and environment can be done at the beginning of new developments.

From a European innovation policy point of view, it may be worth investigating to what extent, and under which circumstances the inclusion of value considerations can be ensured for automatised innovation processes. Policy should be very aware of the risks of an increased automatisation of innovation and possible unintended long-term effects on creativity. Projects should be conducted to study the impact of information technologies and the Internet on creativity and the direction and output of innovation activities.

6.5.3 / **Implications for companies**

In the future, companies will use ICTs more extensively in order to search for solutions and the identification of customer demands on the web, for web based product testing, simulations, and so on. The automatisation of innovation offers many new opportunities for companies, but requires a carefully developed strategy.

With increasing use of algorithms and web based innovation elements, the innovation process becomes faster, more efficient and effective. Fewer resources are required to produce new products and services, and the merging of different fields can enable break-throughs. The reduction of effort required in the early phase of innovation will lower the threshold for innovators and shift the emphasis towards succeeding steps in the innovation chain. Some of the current barriers of profit-oriented product innovation will disappear. Traditional economic "power structures" may erode due to the

easy transfer of algorithms and absence of patenting. The open source society and the dematerialisation of products will offer new opportunities for start up companies requiring less start up capital and offer new business models. However, the idea of wide level of participation has also be adopted within the company and contests, competitions and similar methods may be used within the company to engage and motivate the entire workforce.

On the other hand, the need for data on customer behaviour might lead to oligopolistic economic structures, characterised by the dominant role of few companies with access to holistic data on customer behaviour.

With increasing uptake of automatised innovation patterns, traditional firms might struggle to redefine business models and unique selling points. Speeding up of the innovation pro-cess, combined with the ease of copying software algorithms might lead to difficulties in protecting intellectual property rights in a globalised world.

In addition, there is a risk that algorithms will run out of control and the integration of ethical aspects will be difficult. Disapproval of automatised innovation might lead to an "innovation fatigue" hindering business opportunities. Moreover, too many standardised creative processes may after all hamper creativity. Companies hence must be aware of the long term effects of such a strategy and how they can assure, at critical points, that unique and creative outputs can be achieved.

6.6 / **Infrastructure: New spaces for innovation?**

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 infrastructures may be required to a greater extent.

6.6.1 / **Assessment**

Opportunities in relation to this pattern are:

- This infrastructure may become the backbone of successful collective innovation towards sustainable solutions.
- It seems a highly promising opportunity for Europe to implement an enabling infrastructure to generate high value-added personalised products and service, instead of competing with China in low-price mass production.
- Setting up this kind of innovation infrastructure could become a solution

for some of the problems of urban development. Spaces that are now empty, such as obsolete office and industrial space could be revitalised by setting up innovation infrastructures.

- Collective innovation infrastructures may foster social cohesion, as neighbourhood structures will be strengthened.
- The emergence of an innovation infrastructure for joint innovation between academia, industry, and civil society may be crucial for the success of future innovation ecosystems. These collective innovation infrastructures may nurture a new innovation culture that is better suited to meet future demands.

Associated threats can be summarised as follows:

- Open innovation infrastructures may form a very vulnerable system that is easy to hack. It may be attacked by organized crime outfits.
- Inability or latency of social systems to respond to the need for new social infrastructures.

6.6.2 / **Implications for Policy**

This dimension affects several policy realms: in particular, innovation, environment, employment, and urban development. 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, thereby enabling widespread smart-bricolage and self-production beyond the "creative class." Pilot projects could be funded within existing innovation funding schemes, more experimental types of projects involving people beyond companies and researchers, as well as civil society actors. Old business parks and industrial sites could be used to set up these collective innovation infrastructures. Micro-grants and tax breaks could be used to support people who want to organise such camps, fab-labs and other innovation infrastructure projects. Also, a regulatory framework including IPR solutions enabling such small-scale infrastructures should be put in place.

6.6.3 / **Implications for Companies**

Companies could benefit from new collective innovation infrastructures, as these would enable them to learn together with users to acquire an enhanced understanding of societal embedding of innovations. This may be of particular relevance for small companies that cannot afford expensive market research or even lead user methods for a better understanding of customer demands. Furthermore, provision of complementary services for the new innovation infrastructures will open up a range of new value creation opportunities for both small and large companies (e.g. offering and running

co-working spaces or large 3D-printing facilities).

At the same time, if more products and services are co-produced by users themselves in these infrastructures, some companies will have to revisit their business models.

6.7 / The perception of innovation is changing: Innovation is everywhere or anything is innovation?

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

6.7.1 / Assessment

Opportunities concerning this development are:

- With the emergence of everyday creativity, the gap between business and private life may shrink. Job satisfaction may increase, professions become "vocations" and value creation may instead become value appreciation.
- Education and training may benefit from a renewed emphasis on creativity and intuition.
- Quality of life and social cohesion will benefit.
- Ability to face the complexity of today's life will be greatly enhanced.
- The wide spreading of creativity increases the number of ideas and potential solutions, including eco-innovations and even radical ones. New models of ownership and more durable products may become reality.

Some threats regarding these dimensions are:

- Too great an emphasis on innovation (innovation imperative) may result in creativity becoming a strain on employees, and ultimately kill creativity.
- Hyper-innovation can produce disappointment, uncritical rejection, and serve to stifle innovation.
- Widespread creativity and excessive emphasis on new products and ideas could speed up innovation processes and shorten product life cycles, so a more material-intensive world is created with the number of unnecessary, unsafe and unreliable products and the amount of waste increases.
- A landscape of extremely widespread and over-abundant creativity may pose some challenges for companies. Patterns featuring extreme

flexibility of value propositions and complete openness of "innovation market places," in particular when combined with an erosion of collective values, may become a threat to business. A lack of stability due to permanently changing conditions may cause companies to struggle with forming an identity.

- In a world with this kind of everyday creativity, organisational cultures will have to be much less rigid. Therefore, many large companies and organisations that now follow a command and control pattern in their organisational culture will have problems dealing with this innovation landscape.
- Many people who will not be able to join in this landscape where people continuously need to redefine their identity will be left behind. A "creativity divide" may occur and form a threat to social cohesion
- The traditional creative industry may lose its special role in the innovation process.

6.7.2 / **Implications for Policy**

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 that allows people to be creative in different roles and to build bridges between professional and personal lives. Regulation and administration should support creativity, both in the workplace and in everyday life. "Active jobs" with a high demand/ high autonomy structure, flexible online work, a team-reward system, and non-hierarchical structures should be the rule. 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.

Moreover, raising awareness is required, as good examples suffer from lack of visibility. A sense of urgency is also missing. In many professional areas, creativity is not yet seen as something positive. Governments and the European Commission should set an example for the new world of work.

It is important to understand and exploit the creative potential of different groups. For instance, creativity may be change over the course of a lifetime. Elderly people may have different creative abilities than younger ones in that they may be bolder as they are less afraid of ruining their careers. In order to foster everyday creativity, we need supporting mechanisms for social innovation. Therefore, we need a much better understanding of what social innovators require.

The key, however, towards a creative society lies in education. We need go beyond formal education in order to acquire the skills to get along and perform well in

society. Education should enable people from early on to approach things in a playful, experimental way. Education and innovation are closely tied together. Future education concepts will have to recognise the changing nature of innovation in order to enable young people to contribute to, and benefit from, the new innovation patterns. At the same time, new forms of learning and identity formation will drive change in innovation patterns. Policy measures are needed to prevent large parts of society being left behind in such a development.

6.7.3 / **Implications for Companies**

The increasing pace of innovations can be dealt with in different ways. Companies may try to opting out of the innovation race and try to slow down. They may deliberately not change their products in order to give them a more traditional touch addressing the demand for vintage products that promote nostalgia. Companies may also hide their efforts at making a product look unchanged, focusing more strongly on the more invisible process of innovation. So called pseudo-innovation strategies, which are just superficial adaptations of the same product design are ways companies can pursue to adapt to the innovation race. Another rather traditional strategy to cope with the increasing innovation speed and shortened product life cycles is to apply patents that are then not commercialized. Outsourcing innovation activities to specific organizations or user communities is an alternative strategy which allows companies to keep a stable culture while transferring the often associated 'creative turbulence and uncertainty' to specific sub-industries, companies or groups of society. As a consequence, a firm's corporate culture is also changing, with less pressure than other groups of society to constantly innovate.

Even though companies do not resist innovation completely, they deliberately focus on long innovation cycles by emphasizing the no need for innovation of already 'perfect products.' If such companies innovate, then they hide these efforts in order to make the products look as if they are unchanged (e.g. Rolls Royce), although the innovative technology is behind the dashboard. Such product markets for 'slow down products' particularly exist in consumer markets (living, eating, relaxing, etc.).

More companies may use imitation strategies at the same time. Interestingly enough, we can already observe a trend towards a more positive attitude about imitation, which can even be described as a trend to adopt imitation strategies more frequently. In the last few years, a number of business books have been published that advocate the adoption of imitation strategies. Book titles and slogans such as 'copycats' (Shenkar, 2010), 'Imovation' and 'Imitation Economy' (Bennett, 2010) are evidence of this trend. Companies will hence more deliberately decide when they innovate and when they want

to imitate already existing products.

On the other hand, companies can use the trend and transform themselves as highly creative organisations. The willingness and ability of employees to participate in the innovation process should be used more extensively and should go beyond implementing an ideas suggestion scheme or a financial incentive system. However, there is the risk that employees are burning-out and hence measures to allow for mental health breaks are important as well.

In a world with this kind of everyday creativity, organisational cultures will have to be much less rigid. Therefore, many large companies and organisations that now follow a command and control pattern in their organisational culture will have problems dealing with this innovation landscape. At the same time employees how are not able to realise their ideas with the traditional hierarchies might find new opportunities to establish their own company.

6.8 / **Spatial shifts of innovation: global, local and urban?**

Innovation will change its spatial patterns and local elements are likely to gain relevance, resulting in a better-distributed innovation scene where new regions become more important in global innovation chains.

6.8.1 / **Assessment**

Some of the most significant opportunities are:

- Localised innovation patterns, such as open innovation platforms installed at a city level may cater for a number of new business models such as developing half-finished products provided with local customisation services. The paradigm evokes a revival of the "old" model of local specialisation of production that is based on competence clusters or geophysical opportunities.
- Localised innovation patterns (e.g. city-driven innovation, deliberative innovation) allow for local resource flows and thereby reduced transport. Governing consumption patterns towards sustainability becomes easier, as people are more aware of local resource flows.
- Local participatory innovation patterns, in particular at the level of cities, enable positive resonance between human and technical systems and thereby break-through systemic (eco-)innovations. The local niche level may function as a test-bed for systemic solutions on a global scale.
- Localised participatory innovation settings may foster connectivity at neighbourhood level and bring about shared values, positive energy and thus enhance social cohesion and safety.

- Mobilisation of the critical mass of stakeholders may enable breakthrough systemic solution-finding for societal challenges.

At the same time, this development is associated with some threats:

- Local innovation patterns carry a risk of communitarianism and parochialism. Collective resource pooling and addressing global aspects may become difficult. Radical breakthrough innovations may be hampered in favour of incremental improvements.
- Localised innovation landscapes may block economies of scale. Strong differences between local specificities suggest the lack of global/mass markets and the need of flexibility for companies to adapt to local contexts.
- Explosion of ideas and projects at a local level without catalysts, boundary spanners, mediating platforms and adequate information sources may lead to inefficient processes at a macro level due to a lack of critical mass.
- An increasingly localised and distributed innovation (city-driven, social experimentation) landscape may suffer from a lack of broad and global views. There may be too much focus on the regional or city scale, but insufficient consideration of what happens to the ecosystem at a global level.
- As people are not ready to pay an extra price for the local dimension, this pattern may prove not to be economically feasible (e.g. Amazon versus a local bookshop).
- European R&D landscape may lose ground in global competition with Asia, due to regional fragmentation and relatively small budgets.

6.8.2 / **Implications for Policy**

Large companies from developed economies are increasingly globalising their R&D activities, and some emerging economies, which traditionally played a secondary role in the global innovation landscape, are catching up in developing their own innovative capabilities. These economies will offer their own innovations and products in the European markets and, at the same time, develop products which are aligned to their own needs and framework conditions, addressing customers with low income but high demand. These emerging economies and markets have a great potential for what they present to European companies. On the one hand, European companies can choose reverse innovation strategies, delocalise the conception and production of low cost products and sell them worldwide. On the other hand, they should 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.

The globalisation of innovation and the emergence of new innovation players overseas challenges European industries. In order to tailor products, European industrial companies have to transcend their paradigms. Few engineers are able and willing to develop products for environments with poor infrastructure or low-tech solutions. A paradigm shift towards simple low/mid tech solutions for "the other 90 percent" that are easily adapted to very different contexts is very important. Policy can support this shift by raising awareness for this development. Also, "low-tech solutioning" should play a more prominent role in higher education.

Moreover, systemic innovations for regional needs, developed in the region, will likely gain relevance. The regionalisation of systemic innovation activities will lead to (even more) emphasis of EU RTI policy on regional demonstration projects and relatively less international cooperative RTI projects on the part of companies and research institutions. Systemic innovations and solutions, e.g. addressing work organisation, transport, logistics and energy, will be demonstrated in different regions. Innovation competences visibly go to the public or public-related sector and the lead market concept would be realised and enforced throughout the regions.

Given this shift towards regionally developed solutions, EU policy will have to play a prominent role. 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 that are outside the European Union. Policy should therefore support the development of services and measures that make such transfers possible and enhance ROI. These measures would be more complex than just export support, due to the complexity of information transferred. Such measures are not sufficiently developed as yet. Additionally, policy support would then be awarded more to regions and less to single companies, aimed also at overcoming the possible lack of systemic innovation competencies at the local level.

A further development of the "smart specialisation strategy" is necessary to avoid all European regions focusing on the same sectors and diluting efforts that support innovation. Smart specialisation platforms, anticipation of local 'key enabling technologies' that need to be strengthened, strategic conversation about specialisation within regions, and matching EU support with regional subsidies can support this process.

6.8.3 / **Implications for Companies**

Companies can cope with this development in many ways. Two main levels are relevant:

- On the regional level, companies may get involved in the development of systemic solutions more explicitly as these become more important especially of the community level. Therefore, companies must increase their competencies in working together with different stakeholders outside the company (e.g. officials, citizens, users, operators, designers and architects), in order to understand their approaches and needs, while motivating them to get involved with the company in the design of future solutions and of new services and products. This can create added value at the local level, especially when companies succeed in up-scaling and adapting local systemic solutions to the needs of other customers in other regions of the world.
- On the global and macro scale, the need for global co-operation, in R&D and in market cultivation will further increase. Domination from outside Europe will become even more evident, "reverse innovation" will be the case. As companies often will not able to live from European and US market alone, they have to adopt and develop business models resp. (low/medium tech.) products that aim at the emerging mass markets, also in comparatively low-income countries.

6.9/ **Systemic innovation: Addressing the Grand Challenges?**

Innovation patterns that foster system transitions towards sustainability rather than the isolated development of sustainable products are increasingly required in order to address the grand challenges of our times. This requires, for example, that social and ecological criteria are considered during the entire innovation process, such as by designing circular resource flows as realised by the cradle-to-cradle approach.

6.9.1 / **Assessment**

Opportunities of the trend are:

- An industrial transformation including new forms of work will enable us to reduce our ecological footprint as required.
- Sustainable system innovation will bring about new business models and opportunities. Circular economy innovation patterns bring about multiple new ways for companies to earn money and to create new business. In this landscape «low-tech» can be a cash cow or a business model. New sectors may emerge and opportunities abound, in particular for agile SMEs operating on a local scale.

- Cradle-to-cradle elements in innovation patterns may bring about the new values, competencies and infrastructures required for an eco-consistent economy (emergent materialism). Traditional values such as appreciation of scarce resources may experience a revival.
- New professions will emerge, some of them characterised by highly skilled craftsmanship.
- Innovation patterns focussing on the re-use of existing products (waste-based innovation) have a huge potential to become a stepping-stone on the road towards eco-consistent patterns of production and consumption and a fully eco-consistent economy.
- Consumers will turn towards value-oriented buying, knowledge-based choice-making and even frugality-thinking. Many of the problems created by the current production/ consumption paradigms (e.g. landfills) can be mitigated.

Threats related to this development trend encompass:

- Many of today's companies lack the competencies required for system innovation, as they are very much focussed on individual products. There is still little awareness of the potential for profits arising from the whole system. This lack of competence may hamper the systemic paradigms and – in the case it succeeds – will cause difficulties for a number of companies.
- New "eco-products" could lead to the prolonging of the existing consumption patterns, hinder a value change in society and become a barrier to transition processes.
- Circular economy innovation elements conflict with the growth paradigm that currently dominates global economies. If the concept is not implemented at a global level, the competitiveness of the respective countries and companies will suffer.
- Cradle-to-cradle innovation patterns may lead to a lock-in in a non-sustainable economic paradigm, if we fail to change the economic system towards a full cradle-to-cradle economy with a high degree of immaterial solutions to societal demands and sustainable lifestyles. Also, several negative side effects, such as increased use of water, energy and transport may occur if the focus is too exclusively centred on waste avoidance.
- Innovation patterns with a high emphasis on resource re-use carry the risk of worsening working conditions. The number of low wage jobs with unhealthy working conditions may multiply, a global "waste divide" may emerge with some countries up-cycling the others' waste.
- Extreme re-use-oriented patterns carry the risk of emerging shadow economies with strongly negative consequences for the market and companies.

6.9.2 / **Implications for Policy**

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. Newly emerging industrial paradigms[14] should be explored and supported. This requires more than just the shift in priorities that are already underway in many strategies, such as EU2020. Several complementary measures are required.

Fostering systemic innovations is challenging for policy, as it goes beyond just promoting individual "intelligent" projects. Rather it requires to adopting a systemic view (comprehensive impact assessments, long-term strategy perspective, coordination of projects, the existence of a system integrator, etc.).

To deliver successful system transition insights to society, lifestyle values and culture are as relevant as technological knowledge. Barriers and enablers rooted in social patterns need to be understood as technological challenges as well. One highly relevant case in point is sustainable urban development. Insights into the dynamics of density in cities could be a key element for achieving goals such as the "carbon-neutral city." To explore successful transition trajectories, We need to integrate perspectives from engineering and the natural sciences on the one hand, and humanities and social sciences on the other. To this end, research projects with this kind of trans-disciplinary collaboration should be explicitly supported on an equal footing. 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. Such indicators will allow for holistic assessment of different trajectories and help to avoid funding of innovations with short-term local sustainability benefits, but negative global or long-term consequences. Sustainability standards such as cradle-to-cradle should be fostered and coordinated across nations. In the long run, all products could carry sustainability labels in a similar way as today's household appliances are labelled according to their level of energy efficiency.

Also, a new set of guiding indicators for innovation policy itself will be needed to realise the move towards a value-driven innovation policy paradigm.

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14 Approaches such as the blue economy, cradle-to-cradle, green economy and industrial ecology can be mentioned.

Judging the success of in-novation systems may require more than just monitoring the number of patents and publications. Instead, the contribution of innovation activities towards the long-term quality of life would need to be taken into account.

Another crucial policy lever for system transition is a well-coordinated systemic portfolio of measures. Innovation policy should actively create linkages between different activities and evaluate projects by their fit into the overall portfolio of activities. In order to ensure integration within funded projects, the involvement of organisations with a systemic perspective could in some cases be mandatory for research consortia seeking public funding.

Next to the need to reorient existing RTI policy instruments in ways outlined above, underpinning system transition also requires entirely new types of instruments. There is a need to enable collective socio-technical experimentation to explore successful transition trajectories. Joint learning spaces where users and providers of socio-technical solutions learn together need to be set up. Different formats ranging from focused living-labs to large-scale experiments with innovative concepts in regions or cities need to be installed. Stakeholders need to be not only consulted, but also actively involved in these innovation policy activities.

Finally, to achieve socio-technical system transition, innovation policy coordination efforts need to reach out far beyond the usual realms. Policy fields such as social policy and cultural policy need to be taken on board to tackle social innovation aspects of these system transitions.

6.9.3 / **Implications for companies**

Addressing global societal challenges obviously offers many business opportunities for companies. Accordingly, several companies continuously orient their innovation strategies towards markets emerging from global needs such as health, security, energy, and food. Value and job creation in green markets is expected to rise. European companies that are now mainly looking to domestic demands will have to adopt a global perspective and learn to address markets with very different framework conditions.

Sustainable system innovation, however, is posing a more radical challenge to companies. For one thing, rather than assessing only one aspect of sustainability, indicators need to be monitored along the entire product life cycle. Sustainability-oriented performance indicators have to be integrated and used for strategy and product development. Moreover many sustainability strategies such as cradle-to-cradle approaches require new organisational and technical capabilities.

Even more challenging is the need to find altogether different approaches to fulfil various societal demands. Rather than innovating on individual products, services or processes, entire value chains need to be revisited in

order to assess and promote socio-technical change towards sustainable paradigms of production and consumption. This is far beyond the scope of many companies – although larger companies may serve as system integrators –, as it requires knowledge, skills, and access to resources beyond their capabilities. Complementary efforts from the public sector are required to enable companies to engage in systemic sustainability innovation in a coordinated process together with other stakeholders. Large-scale socio-technical experiments will allow companies to understand business opportunities emerging from different socio-technical settings. Companies will have to learn to engage in such collective learning endeavours and interact with actors from different corners of society. Many companies at present lack the competencies required for systems innovation as they are very much focused on classical product innovation. There is still little awareness of the potential for profits arising from the entire system.

Finally, sustainable products are often more simpler products and designing such simple products offers new opportunities. We see already today many industries and markets where an "over-engineering" takes place and new companies serve with very simple products the basic needs of the customers.

6.10 / **Policy challenges at a glance**

The analysis of various innovation visions allowed us to synthesise specific key characteristics describing the changing patterns of innovation. Based on an assessment of opportunities and risks along these eight dimensions of change, we discussed implications for policy and accordingly indicated new directions for research and innovation. A brief analysis of current policy strategies at the European level and the OCED shows, in this context, that in general i) open innovation, ii) the emerging innovation landscape on a global level, iii) intellectual property rights (IPR), and iv) grand challenges have gained the most attention within current policy debates related to new forms of innovation.[15]

From the findings of our INFU project, we can summarise main challenges for policy-making (see box). They are in line with some of the most recent EU

15 *Important policy documents, studies, and strategies are the OECD innovation strategy launched in 2009 (OECD 2009), an OECD project about the "New Nature of Innovation" (OECD 2009), the Aho Report from 2006 (Aho 2006), the EU innovation strategy from 2006 (EC 2006), the Europe 2020 strategy, and more specifically the Innovation Union Flagship initiative (EC 2010). The OECD project about "New Forms of Innovation" is probably most closely related to the aims of the INFU project as it explicitly asks how the innovation processes are changing and what this means for innovation policy. In the introduction the OECD summarises very well the essence of new innovation models: "Co-creation, user involvement, environmental and societal challenges increasingly drive innovation today. Collaborative, global networking and new public private partnerships are becoming crucial elements in companies' innovation processes" (OECD, 2009).*

and OECD policy documents, and therefore underpin and extend their guiding principles and policy conclusions. However, we also offer lessons for policy that go beyond these topics. In particular, the need to provide new forms of infrastructure, the increasing role of software with its significant positive and negative potentials, as well as the need to use new indicators (considering the importance of value-driven innovations) reveal new directions for policy-making. In addition, policy should support companies to develop business model innovations.

Moreover, in order to ensure that progress towards grand challenges is made, in many fields real transformation at a system level is required, which goes beyond isolated development by individual actors. This means, for example, that social and ecological criteria are considered during the entire innovation process. Also, coordination among many actors from the economy, science, policy and civil society is required, exceeding superficial consultation. In many cases, a system integrator must be established.

Education and innovation are closely tied together. Education policy will receive an important domain in the future regarding innovation and competitiveness. Future education concepts will have to recognise the changing nature of innovation in order to enable young people to contribute to and benefit from these emerging patterns.

The conclusions for policy have been discussed mainly at the European level. New innovation patterns, however, also require policy reactions at the national and regional level as well as on a global scale.

The INFU policy challenges can also be linked to the four INFU scenarios. Accordingly, each scenario emphasises different challenges and changes: Scenario 1 "Unleashing the Creative Spirit. Europe's Innovative Societies," among other things, describes and examines how collaboration could be fostered and at the same time highlights the role new ways indicators for measuring wealth and holistic system thinking in education have for a successful future of Europe`s innovation landscape and society in general. In contrast, scenario 2, "The Exhausted Giant: European Innovation Fatigue," illustrates the negative consequences that could result from not addressing named challenges such as a brain drain to other regions and problems due to the demographic change. Furthermore, it shows that more web-tools might not be able to counteract the loss of the human factor in innovation. Scenario 3 "Locally-Driven Innovation," depicts a future in which new forms of coordination and local innovation emerge. Under such conditions, social entrepreneurships flourish and provide answers to environmental and social challenges. The fourth scenario, "Prometheus Unbound: Innovations for Innovation's Sake," sets focus on positive and negative aspects of an increased and broad level of participation, as well as changes in the educational system.

The INFU policy challenges at a glance

- **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.
- **Enable participation.** Build up competencies for a participatory society and develop tailored procedures for different types of interaction of actors from academia, industry, education 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.
- **Policy for social enterprises.** Raise awareness of the relevance of social innovation, understand the requirements of social innovation and develop adequate support mechanisms.
- **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.
- **Value-driven innovation.** Motivate innovation around grand challenges. Support innovation for its outcome instead of 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.
- **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. 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 developing countries and help to deepen scientific and technological cooperation along with the transfer of technology.

- **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.
- **Enable transformative system innovation.** Foster system-oriented research, development and innovation projects through involving such things as mandatory system integrators. Integrate technical and social science and humanities research in innovation processes and weight them equally. Involve stakeholders and enable large-scale socio-technical experimentation.
- **Policy coordination.** Coordinate policies across DGs/ministries concerned with innovation, but also orient innovation policy 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.
- **Innovation link chains.** Focus on links in the innovation chains leading from research to innovation, including societal embedding instead of at looking at R&D in isolation. Assess projects by their system fit and enhance the capacity to innovate.
- **Software.** Software will play an ever-growing role in innovation. More innovation steps may become automatised, by using web crawlers to identify ideas, or by using simulation algorithms to generate ideas and to assess market potentials. Policy should be very aware of the risks of an increased automatisation of innovation and possible unintended long-term effects on creativity. Thus, they will be asked to seek a balance between ensuring data security and transparency, on the one hand, and to enable faster and efficient innovation processes based on software algorithms on the other.
- **Innovation infrastructure.** Install infrastructure such as fab-labs and innovation camps with a low entry barrier collective innovation and smart bricolage for all actors and civil society in particular. Make use of the possibilities of modern ICTs and methods to enable participation.

7 / Summary and Conclusions

The way we organise innovation is changing. One hundred years ago, the Austrian economist Joseph Schumpeter viewed the entrepreneur and the development lab as prime loci of innovation. However, today innovation is seen as something that 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. Accordingly, innovation is not primarily driven by entrepreneurial firms. More often than not, innovations are developed within a network of customers, universities, citizens and public organizations. New paths and arrangements for developing and adopting new products, services, and solutions are driven by new technologies, the willingness of customers and citizens to contribute to innovations against a backdrop of global economic competition and rising educational backgrounds. While most studies to date have investigated specific forms of innovation, the INFU project takes a broader view aiming to investigate how different innovation models may evolve in the future. For the first time, a foresight project is conducted to analyse and discuss the future development of new innovation patterns and their implications for society, economy and European policy.

Within the INFU project, we are interested in how the process of the creation, development, and introduction of innovations is changing and hence concentrate on the process of 'innovating innovation.' We have a broad understanding of innovation as encompassing economic, social, and public domains. An innovation pattern is defined as the underlying principle in how the innovation process is organised, which also includes new perceptions about innovation, the involvement of new actors, and the generation of new interpretations in society.

The INFU approach

INFU is a foresight project that develops plausible and relevant long-term scenarios of future innovation landscapes in order to orient long-term strategy building for policy and other innovation actors. The project implemented a progressive explorative dialogue with key stakeholders and experts, using advanced creative methods that fostered thinking beyond established pathways.

Based on an analysis of various sources including academic literature, Internet, blogs, newspapers, and magazines, sixty-eight (68) 'signals' pointing towards emerging innovation patterns were identified in the first phase of the project. These signals are international cases from industry and the more general society, describing how innovation is organised in very different and novel ways. A signal, already visible but not having yet reached the mainstream, is defined as a trend

with the possibility of change, as well as a potential strong or even disruptive impact. In our context, a signal hence indicates a change in an innovation pattern, which is not established as a common way of innovating within a certain sector.

The signals of change we collected during the project have revealed that many of the observed practices can be referred to as concepts or strategies already described in the academic literature. Concepts and models such as open innovation (Chesbrough 2003), user innovation (von Hippel 2005), value innovation (Kim and Mauborgne 1999), soft innovation (Stoneman 2007), crowdsourcing (Howe 2008), and social innovation (Mumford 2002) can be mentioned in these contexts that have been defined and discussed extensively in the academic literature. However, the collection of our signals of change reveals that in practice the innovation actors often combine elements or strategies in a new manner or realize strategies for an entirely new application field, thus expanding our thinking about possible innovation futures.

Based on the scanning of signals of change and academic literature review,, the INFU research team generated and visualised twenty innovation visions. These visions were formulated in a creative way by amplifying and combining some of the signals in order to develop coherent and sometimes provocative pictures of possible future innovation practices. Thereby, we transferred an idea already applied in one field to other sectors, or generalised a signal considered to become a certain mainstream innovation practice.[16] To provoke discussion, some visions were brought to an extreme. In addition, the team conducted interviews with industrial and academic experts, and implemented an online survey to discuss and assess the innovation visions. These visions have subsequently been clustered and consolidated, resulting in eight visions being selected and further elaborated upon. Specific working groups comprised of more than 70 participants across Europe then discussed the visions.

These "visions" were then confronted with different possible socio-economic framework conditions and global mega-trends to finally synthesize scenarios which integrate micro, meso, and macro elements of possible innovation futures. In the final stage of the INFU project, the visions and scenarios were assessed and implications for companies and policy were generated.

We expect a number of main trends and possible pathways concerning the question of how innovation will be organised in the future. In the following pages, we synthesise our findings and focus upon the drivers we presume to have the most decisive influence on the future evolution of the innovation process. The future innovation landscape can be shaped by society, economy, and policy. We thus describe the most critical elements that will very likely determine the future

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16 See also a short video about the innovation visions on the INFU web page.

development and can be, at least to some extent, deliberately governed and shaped by individuals, organisations, and policy.

Towards open and participatory forms of innovation

The trend towards a further opening of the innovation process will continue and become even stronger in the coming years. Innovation models and examples presented, such as the organisation of innovation contests, crowdsourcing projects, innovation camps, open source software development, online voting to the approval of new products and other forms of user involvement all provide evidence for this development.[17] Open innovation, user innovation and community innovation is probably not a new or emerging phenomenon but already a significant trend. However, at the moment and in the future, this phenomenon is very likely to diffuse across industries but also the public sector. In the course of our scanning activities we identified a number of examples of how very different actors are involved in the innovation process, ranging from suppliers, research institutions, public organisations to everyday users and citizens.

This development is not just driven by companies, which for instance, organise innovation contests or crowdsourcing projects. Flexible working patterns, outsourcing and the increasing number of professional freelancers, foster and enable the emergence of new organisational innovation strategies. In addition, the possibilities to use the internet for sharing knowledge, building relationships and offering ideas, services and products with low transaction costs enables this development. The further individualisation of society is a driver for this development, which, as one effect among others, increases peoples´ ambitions to express themselves. By influencing the design of products, individuals may change the functionality of solutions and services according to their individual needs. Due to the growing awareness of customers and citizens to shape the direction of innovation and enhance the quality of the innovation output, the innovation process becomes more and more deliberative and consultative.

Based upon the speeding up of the innovation process and increased efficiency and effectiveness that open innovation and crowdsourcing of innovation might achieve, we expect new opportunities for business activities in Europe to emerge. These open innovation marketplaces offer the possibility for companies to externalize risks that are linked to innovations. The efficiency gain may compensate for relatively high wages in Europe and increase the competitiveness of European companies. Smaller companies might be best positioned to take up business possibilities in a constantly changing business environment with a focus on local innovation. Diverse opportunities for SMEs and start up companies, for

17 See also chapter 3 for a description of the innovation visions.

instance, will arise because of new business models and new "power structures" within the innovation system. "People empowered" decentralized business models could possibly challenge today's big companies, but offer new business possibilities to start up companies. Companies relying on traditional strategies for the protection of their knowledge base may have difficulties coping with such a situation. A number of companies may struggle to redefine business models and unique selling points in a highly flexible and unstable landscape with open innovation networks and marketplaces. At the same time there is also some risk that we suffer from an overload of ideas within adequate processes to select and implement them.

New motivation patterns for innovation

The motivation of organisations and individuals to develop innovation is changing as well. Intrinsically motivated users, communities, citizens, and social entrepreneurs are adding their motivations to company innovation activity, complementing the typical driver of profit motive. The growing awareness of climate change, social tensions, and the inefficient use of resources are driving forces for changes in innovation patterns. Solving societal problems becomes an important driver to innovate, for both companies and individuals. In addition, people are motivated to contribute to innovation activities, for instance, within open source communities, crowdsourcing initiatives or ideas competitions. Active involvement in the innovation process is driven by different motivations: it could be trendy amongst a certain social group or originate from the need to create very specific individual products. It could be just to have fun, to be creative or represent a strong belief in creating truly sustainable products. There is evidence, that there is a change in the way innovators and being innovative is socially rewarded in that being innovative is becoming more socially desirable for a growing number of people.

The interplay of very different actors both private and public, organisational and individual, with different ambitions (profit and non-for profit-driven) all lead to innovation patterns which are hence hybrid. Each being governed by means of hierarchies, markets and communities, they are situated across classical economic sectors, actor arenas and policy realms and they function according to a different logic than classical business driven technological innovations.

Innovation patterns and visions that allow a more sustainable development clearly emerged as the most desirable and relevant construct developed by the INFU team. In that sense, the desired innovation outputs are driving forward the adoption of new innovation patterns and hence the innovation processes. Many proponents and actors aiming to achieve truly sustainable solution often advocate a highly participatory approach that starts as a grassroots movement on the

regional level. However, our findings also show that bottom-up patterns do not necessarily guarantee that novel ideas and visions can be achieved. Experiences of highly participative initiatives on the community level have shown that up-scaling, transfer and regulation are needed to realise sustainable solutions, too. An upscaling of localized products or solutions can be done, for instance, by transferring innovator's knowledge into toolkits which then can be reused in similar situations.[18] While a top-down implementation of systemic sustainability innovation is rejected, there is the awareness that some forms of regulation, coordination, and up-scaling activities are required.[19] Thus, our project found clear evidence that new forms of innovation do not necessarily contribute to sustainable development and may even harm such developments.

Within the INFU project, we also identified and discussed more radical models and ideas that were often brought up by the younger European citizens. Such developments point towards fundamental change in the macro-economic environment. Ideas such as "blue economy", "economy of contributions," "on demand economy," "surplus ecosystem," or "learning intensive economy," assume that the behaviour of private and public actors change dramatically. While many of the suggested futures may not be serious in a literal sense, it may be wise to take these ideas to be indicative of emerging challenges for current established perceptions of conditions of change for innovation.

Sustainability as a driver of change in innovation patterns thus imply much more than just the direction of innovation efforts towards green products and services. Rather, the innovation patterns themselves need to change to enable transformative and systems innovations underpinning transitions that can only be achieved through social and technological innovation in close alignment, requiring top-down and bottom-up initiatives. For instance, in the scenarios, "Unleashing the Creative Spirit," and "Locally-Driven Innovation," we assumed that Europe was capable of meeting this challenge by a change in actor behaviour, adequate regulation, and successful coordination mechanisms between all the actors.[20] In contrast, we may also see an innovation future (Scenario "Prometheus Unbound"),

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18 *The empirical evidence we have synthesised reveals that in bottom-up initiatives individuals should give up their expertise position (something that they are generally reluctant to do) and acquire teaching and coaching capabilities to be able to effectively transfer their knowledge (see for more details also Warnke et al 2011).*

19 *The discussion on sustainability can also be linked to the critical discourse about economic growth and the role of innovation and technological progress for economic growth (e.g. Paech and von Ossietzky 2007). Some authors, for instance, claim that a true sustainable development needs to be unlocked from the economic growth paradigm (e.g. Daly 1996) which, in turn, would require another innovation purpose.*

20 *See also chapter 5 for an overview of all scenarios; for the full documentation of the scenarios see Mahn et al. (2011).*

where Europe is still competitive based on (product) innovations but fails to address the key societal problems and challenges. In this scenario, sustainability is mistaken, by fostering end-of-pipe technologies, solely isolated and technology-based measures to improve environmental sustainability of business activities, and no change towards sustainable consumption patterns. Thus, a true transformation was not achieved. Apparently, fostering systemic innovations is challenging for policy, as it goes beyond just promoting individual "intelligent" projects. It also requires us to adopt a truly systemic view (comprehensive impact assessments, long-term strategy perspective, coordination of projects, existence of a system integrator, etc.).

The limits of participation

Although participation will gain importance, this development also had some limitations and may also reach a tipping point in the long run. Many innovation researchers argue that new forms of open and user driven innovation speed up the innovation processes. However, a few also alleged that more participatory forms of innovation would slow down the innovation process (EC 2007).[21] Such a slowing down is, for instance, related to the innovation vision 'negotio-vation' that assumes customers and citizens vote by different means as concerns the direction of product development. In addition, we expect that in the future, some kind of participation fatigue may emerge that contributes to a deceleration of the innovation process in some areas.

Some experts involved in the INFU project argued that high levels of participation tend to produce only average quality. Compromising to include a wide range of social requirements may reveal lukewarm solutions. On the one hand, participatory processes might hinder a long-term transition towards more sustainable ecosystems because the majority of society may not accept negative short-term effects at an individual level. On the other hand, strong project statements and decision-making cultures tend to weaken participation and discourage engagement. Moreover, an extensive externalising of the innovation process and its inherent risks by companies without adequate compensation of the innovators may lead to emergence of the "creative poor" class in the long run. The question for companies, public organisations, and policy is thus: what is the adequate level of participation that assures real creative solutions can be realised, long-term competitiveness can be achieved, and societal problems are addressed?

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21 An expert group established by the European Commission summarizes to highly collaborative forms of innovation as follows: 'The regime of collective experimentation faces challenges because such embedded innovation is laborious, typically loosely-coordinated and slow; as it should be, because users and other stakeholders have their own contexts and logics to consider' (EC 2007, 27).

In addition, innovation will remain a closed or secret activity to a certain extent, or relegated to specific industries in the future. The signals of change we have identified, point to the fact that product piracy and product imitation cases are rising. This may also hint at a return to even stricter models of closed innovation processes. The increasing anxiety about product piracy may induce companies to decrease their willingness to integrate external sources into some of the crucial stages of new product development. We may also see a development where many companies learn the slogan "open innovation" the hard way. Companies might discover that the dissipation of intellectual property is too arduous and competitors from overseas quickly learn to sneak into innovation processes, often making it first to the global market (with products possibly developed in Europe). This is of course related to the question of Intellectual Property Rights (IPR) and its development. In this context, the European Patent Office (EPO) scenario report (EPO 2007) has a more critical view about the development of the patent system and, considering the growing number of patent applications, whether it can be managed as effectively as in the past. The scenarios developed by an expert team vary considerable ranging from envisioning a future where large multinational still drive the patent system and build up powerful patent portfolio on the one hand to a future where we see a gradual erosion of the patent regime due to diminishing social trust and growing criticism of the patent system.

New technologies enable new forms of innovation

Technology is a driver for how we organise the innovation process: from idea creation to the launch of new products and services on the market. From a technological perspective, especially new Web 2.0 applications and software algorithms are bringing about changes in innovation patterns, as they make sharing of knowledge and collaboration easier and more affordable on a global scale. Many innovation futures are driven by the growing ability and willingness of everyday people to deal with social media and collaboration tools. This driver is closely connected to the aspect that the younger generation is about to enter the business world, bringing with them new ways of thinking about (free) knowledge sharing, collaborating and inventing. Within this context, with automatised innovation, we envisaged that a number of new techniques, such as the semantic web analysis allows for automatising parts of the innovation process. Techniques ranging from idea generation via design to testing are included. In this model, sophisticated semantic web-filters track changes in consumer preferences and new ideas in real time, and automatically extract the innovations with outstanding market potential. However, it is difficult to envisage the long-term impacts of such a development. Speeding up the innovation process, combined with the ease of copying software algorithms, may lead to difficulties in protecting intellectual property rights in a globalised world. Moreover, too many standardised creative processes may after all hamper creativity. .Algorithms may induce users into

peculiar thinking models and restrictive directions and automatisation may favour incremental, far less disruptive patterns. Moreover, an IT dependency might arise if innovation processes become automatised potentially reducing diversity and creativity and hindering the possibility of defining a unique selling point.

New manufacturing technologies coupled with information technologies also drive innovation patterns, allowing for new forms of innovation to occur. The on-demand creation of personalised products facilitated by 3D printing and fab-lab tools is related to some of the innovation visions we developed which allows to realise new production and consumption patterns and is associated with the emergence of the so-called "prosumers". This development offers many new opportunities, but also bears some risks. Sustainability impacts, for instance, are hardly considered and there is even some evidence that this model will not contribute to a sustainable development in its current form.

Innovation is both: local and global

Another main trend is the regional shift of innovation. Innovation will become both more global and more local at the same time. With the provocative vision 'relocated innovation,', for instance, we envisage that the West adopts the role of a follower, while Asian countries become innovation leaders. Western companies have to face products primarily designed for a different cultural contexts and imitate and copy products from Asia. Creative people might even migrate to new innovation hot spots in Asia and send their salaries home to the US and Europe. The current tendencies of 'globalization of wisdom' would hence be limited by specialized regional innovation clusters.

As a result of this changing innovation pattern, we expect amongst others that some European companies will more often pursue imitation strategies. Thus, although currently product piracy and imitation are said to be mainly done in the new emerging countries, western countries may start to follow imitation strategies in the future.[22] However, imitation should not merely be understood as an easy or activity lacking reflexivity, but as authors argue, as an activity that requires a certain level of creativity, very specific capabilities, and ultimately, a small but certain amount of innovativeness as well.

INFU illustrates a number of innovation visions that focus upon the regional or urban levels, which are seen as important centres of innovation in the future. With

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22 *Interestingly enough, we can already observe a trend towards a more positive attitude about imitation, which can even be described as a trend to adopt imitation strategies more frequently. In the last few years, a number of business books have been published which advocate the adoption of imitation strategies. Book titles and expressions such as 'copycats' (Shenkar, 2010), 'Imovation' and 'Imitation Economy' (Bennett, 2010) are evidence of this trend.*

the scenario "Locally-Driven Innovation," we synthesised this trend, claiming that Europe may be able to benefit and exploit the opportunities of locally driven innovations in the way of high involvement and motivation of citizens to develop and realise new solutions and strong local governments enabling such developments. However, the risk of a partly inefficient duplication of efforts, or the inability to realize large-scale projects to serve global markets is a risk of such a scenario. The explosion of ideas and projects at a local level without catalysts, boundary spanners, mediating platforms, and adequate information sources may lead to inefficient processes at a macro level. Lack of critical mass is another risk of such a development path and related to the argument presented above regarding how to achieve true sustainable development. Moreover, the European R&D landscape may lose ground in global competition with Asia, due to regional fragmentation and relatively small budgets.

Given this shift towards regionally developed solutions, European and regional policy will have to play a prominent role. It is not just about enabling and supporting (large-scale) demonstration and testing initiatives, but also making sure that the results of such projects are transferable to other regions and markets that may be outside the European Union.

Localised innovation patterns, such as open innovation platforms installed at a city level, may cater for a number of new business models such as developing half-finished products provided with local customisation services.

Towards an innovation society?

Innovation and creativeness will gain more importance in the economy, and innovation will be diffused throughout everyday life. Thus, an innovation society may become reality. This development is, for instance, also described within the scenario "Unleashing the Creative Spirit: Europe's Innovative Societies." In this scenario, the innovation potential of the societies in the Union has been extensively activated and social communities and creative individuals are the main source for innovations. Thus, innovation activities will happen everywhere and people are tremendously willing and highly motivated to innovate.

However, we also have identified some problematic aspects and effects of these innovation patterns. We observed some counterbalancing trends as well. The constant pressure to innovate may have negative and unintended consequences. If a greater number of people suffer from constant pressure to innovate, innovation as a principle could become something undesirable and negative in organisational culture. Consequently, people may increasingly feel compelled to use their spare time to meet never ending innovation demands, which, in turn, could have negative effects on their health. In addition, professional designers and engineers may feel threatened by the distributed innovation model fearing to lose their jobs due to the large number of new actors who innovate beyond

traditional structures. A further problematic aspect of an ever-changing innovation landscape and increased pace of innovation is that we lose to ability to exploit the economic gains of innovations properly. Many innovation studies have shown, for instance, that positive effects on productivity requires the use of new products or technologies over a certain period of time, e.g. that learning can occur.

A reverse trend may hence be that innovation fatigue takes over and 'no-innovation' becomes en-vogue in certain areas, emerging as a trend in itself in the long term. This critical and rather sceptical innovation vision was the only one amongst all visions developed, which explicitly expresses a deceleration of the current innovation practice. One strategy is, for instance, that companies deliberately leave their products unchanged in order to give them the image of a more traditional and vintage touch. Companies may also hide their efforts at making a product look as though it is unchanged, focusing more strongly on invisible process innovation. A rather traditional strategy to cope with the increasing innovation speed and shortened product life cycles is to apply patents which are then not commercialized. The slow food movement is also related to this trend (e.g. Pietrykowski, 2004). The goal of the slow food movement is to create regional networks of agricultural production and consumption, which allows small producers to maintain their traditional production methods with other types and fewer levels of innovation. Inspired by the 'slow food' movement, one can now proclaim a 'slow innovation' program. According to the slogan: "Keep good things unchanged, and change what can be done better for the good things." In this context it can also be observed that in some areas new opportunities often emerge for companies who offer simple products while incumbents often focus on making products more and more complex ('over-engineering') but do not offer a true value for the customers at the same time.

With the scenario "The Exhausted Giant: European Innovation Fatigue," we have described such a possible future. One may envisage that innovation has lost its positive connotation and is increasingly regarded as an undesired burden, something disruptive to society. Companies feel that they are better off when they limit the number of people involved in their innovation process, and voluntarily abandon all attempts aiming at the opposite.

It is especially worth noting, that for all visions, the risk of social divide was explicitly mentioned. Accordingly, the innovation patterns previously discussed seem to be at a critical point where the possible acceptance of society needs to be addressed and a deliberate active steering of the development could lead to many benefits such as systemic improvements. On the other hand an uncontrolled development, driven by external forces, combined with a rejection of portions of society, may lead to the exclusion of specific groups from the innovation process. In this case, new innovation patterns will bring about short-term benefits for specific groups while negative side effects for the system as a whole exist. We are

therefore facing a unique window of opportunity for actively modulating changing innovation landscapes in a way that allows us to reap the potential benefits and avert many of the threats.

There is a clear call for all actors involved in the innovation process to carefully revise existing innovation strategies. Considering the trends in innovation, the question arises of whether we probably have some kind of "innovation crisis." Although we may typically observe more of the same incremental innovation everywhere, there are but a few radical innovations across many industries. The concept of innovation may even lose its character to serve as a competitive weapon for some companies (in some industries), and the most important problems in society remain unsolved.

To conclude, while it would be desirable to envisage the future of innovation as open, socially and environmentally driven, faster and global, it would be too easy, simple and generic to leave things there. INFU has revealed a much more diverse and broad future for innovation, pointing to various tensions and ambivalent developments. We will continue to see more participation, but at the same time should note the points of saturation, too much participation may just create lukewarm solutions or slow the innovation process down altogether. Individual, organisational, and public actors will be part of the innovation process, influencing the pace and direction of innovation well into the future. We must take care to mitigate the negative effects of development. Thus, joint efforts between companies, customers, citizens, scientists and policy makers are needed to shape development and unlock the potential of innovation to create wealth, employment and consider the societal needs of tomorrow.

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23 With exception of the Management Reports all deliverables can be downloaded from the INFU web page: www.innovation-futures.org,

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Deliverable 8.2: Summary Management Report including summary of project results.

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Appendix A: List of contributing experts

The following experts have been contributed during the INFU workshops by participating in workshops, organising panels or by giving interviews.

Hugues Aubin, Rennes City Council, France

Charlotte Awidi, European Comission DG Enterprise and Industry, Belgium

Javier Ayneto Gubert, Director de Innovación, IDOM, Bacelona, Spain

Catherine Barbé, Sustainable City Institute, Paris, France

Michael Bartl, Hyve AG, Germany

Boris Beaude, Geographer, EPFL, Switzerland

Mohammed Benabbou, Villeneuve d'Ascq City Council, France

Florent Bernard, DG Research and Innovation, Belgium

Raphaela Biddault-Wattington founder of Idea Engineering Laboratory LEED, Paris, France

Sylvie Blanco, Grenoble Ecole De Management, Grenoble, France

Amandine Brugière, Fing, FR

Jean-Claude Burgelman, DG Research and Innovation, Belgium

Jeff Butler, Manchester Business School, UK

Mario Cervantes, OECD, France

Jean-Philippe Clément, Paris City Council, France

Patrick Corsi, KINNSYS Consulting, Brussels, Belgium

Roger Cox, Let´Cradle Campaign, Venlo, The Netherlands

Ronny Daniell, Blekinge Institute of Technology, Denmark

Sascha Dannenberg, FU Berlin, Germany

Liesbett De Letter, DG Regional Policy, Belgium

Philippe Destatte, Institute Jules Destree, Namur/Wallonia

Philippe de Tilbourg, Greater Bordeaux Council, France

Michèle Dougé, Consultant, Paris, France

Philippe Durance, Cnam, France

Ralf Eichhorn, Wirtschaftsförderung, Germany

Shirin Elahi, Scenarios Architecture, UK

Penti Eklund VTT Helsinki, Finland

Jan-Peter Ferdinand, IOEW, Germany

Elisabeth Florescu, , The Millennium Project, Calgary, Canada

Joachim Galler, Modern Media & Technologies Galler GmbH, Austria

David Gann, Imperial College London, UK

Anil Gupta, Indian Institute of management, Ahmedabad, India

Alexander Greisle, work.innovation, Germany

Marc Gruber, EPFL Lausanne, Switzerland
Loïc Hay, Artesi Ile de France, France
Anne-Christine Habbel, Software Company, KA, Germany
Armand Hatchuel, Mines Paris Tech, France
Thomas Heinemaier, DG Enterprise and Industry, Belgium
Laurent Hoffmann, until we see new land, Berlin, Germany
Emile Hooge, nova7.fr, France
Sophia Horwitz, Blekinge Institute of Technology, Denmark
Michel Ida, Ideas Lab Minatec, Grenoble, France
Corinne Iehl, Manager of CRé'Avenir, France
Jonathan Imme, Palomar5, Berlin, Germany
Paul Isherwood, GlaxoSmithKline, UK
Olivier Jouen, Port Parallèle in Paris, France
Daniel Kaplan, FING (Fondation Internet Nouvelles Générations, France
Juha Kaskinen, Finland Futures Research Center, Finland
Per Kilbo, IVF, Sweden
Simone Kimpeler, Fraunhofer ISI, Karlsruhe, Germany
Eva Kirner, Fraunhofer ISI, Karlsruhe, Germany
Gold KJW, Jonsei University, Korea
Bernhard Kölmel, CAS Software AG, Germany
Paul Labrogère, Alcatel Lucent Bell Labs, France
Maud Le Floc'h, Director of pOlau in Tours, France
Benny Leong, Honk-Kong Politecnic, Design department, Honk-Kong
Renate Loskill, Federal Ministry of Education and Research, Germany
Yann Le Tilly, CanalTP, France
Thierry Marcou, Fing, France
Mats Magnusson, KTH Stockholm, Sweden
Hervé Mathe, ESCC Business School, France
Laura MacPherson, Blekinge Institute of Technology, Denmark
Mats Magnusson, IMIT – Institute for Management of Innovation and Technology, CH
Bruno Marzloff, Chronos, France
Ezio Manzini, DIS Indaco Politecnico di Milano, DESIS network, Italy
Erika Merz, Kemmler + Merz, Büro for Interaktive Produkte und Medien, Germany
Georg Mildenberger, Centre for Social Investment CSI, Germany
Ian Miles, Manchester Business School, UK
Riel Miller, xperidox futures consulting, Paris, France
Kiemen, Mixel, Vrije Universiteit Brussel, Belgium
Yuin Mo, Manchester Business School, UK
Andrei Nestian, University Alexandru Ioan Cuza, Romania
Georg Oenbrink, Evonik Industries, Germany

Michael Paula, BMVIT, Austria
Guy Peudupin, Nouveaux Armateurs, France
Valérie Peugeot, Orange Labs, France
Fabienne Pierre, United Nations Enviroment Programme, Paris, France
Juliane Pohl, Zentrum für gesellschaftlichen Fortschritt, Ffm, Germany
Rafael Popper, Manchester Business School, UK
Maurita Prato, Blekinge Institute of Technology, Denmark
Jean Marie Pruvot, North France Innovation Development, France
William K. Ralston, Vice President SRI Consulting Business Intelligence, US
Jose Ramos, Avanzalis Knowledge Associates, Barcelona, Spain
Rebecca Rangnow, ISI, Germany
Mikko Rask, National Consumer Research Centre, Finland
Charlotte Rautureau, La 27e Région, Paris, France
Paul Richardet, Silicon Sentier, France
Simon Richir, Paris Tech, France
Peter Robbins, The Innovation Foundations, UCD, Ireland
Gilles Rougon, Design Manager EDF R&D ENERBAT, France
Domenico Rossetti di Valdalbero, DG Research and Innovation, Belgium
Bror Salmelin, DG Information Society, Belgium
Henry Samier, ISTIA Innovation, Angers, France
Christian Saublens, The European Association of Development Agencies, France
Björn Sautter, Steinbeiss, Germany
Jörg Schatzmann, FU Berlin, Germany
Jack Smith, University of Ottawa, CA
Rolandas Strazdas, Vilnius, Lithuania
Karl-Erik Sveiby, Prof. at Hanken Business School, Helsinki, Finland
Thomas Teichler, Manchester Business School, UK
Anna Trifilova, Head of the Management and Marketing Department Nizhny Novgorod Architecture and Civil Engineering State University, Russia
Dilira Trupi, PhD students at Silicon Sentier in Paris, France
Gereon Uerz, Volkswagen Foresight Department, Germany
Henriette Van-Eijl, DG Enterprise and Industry, Belgium
Mieke Van Gramberen, Flanders Synergy, Belgium
Bettina van Stamm, Exeter, UK
Roberto Verganti, Business Management, Politecnico di Milano, Italy
Stéphane Vincent, Director of La 27e Région, France
Michael Wiesmüller, BMVIT, Austria
Ansgar Zerfaß, Uni Leipzig, Germany
Charlotte Zuckmeyer, Manager of Respublica Conseil, France

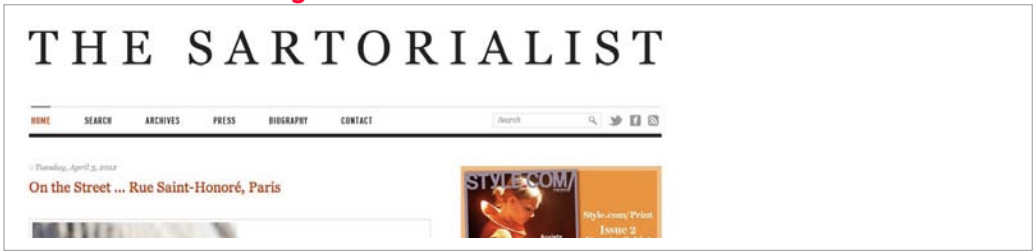
Appendix B: List of signals of change

Holistic Innovation – Fusion of Product and Service Innovations

More and more companies seek for new ways to enlarge the customer value and the related product success by enhancing products with suitable service innovations. The classic example is Apple´s iPod and the integration of comprehensive service offers by iTunes.

SHELTON, R., (2009), Integrating Product and Service Innovation: Industry leaders complement their product offerings with service innovations to boost overall customer value, in: Research Technology Management, Issue May - June 2009, p. 38 - 44

Street Fashion Blogs



Street fashion blogs are at the beginning the initiative of anonymous people posting in their blogs pictures they took in the area where they live of other people they consider dressed in an original and cool way. A series of these street fashion blogs are then used as sources of inspiration for the fashion community and for trends watching in general.

http://thesartorialist.blogspot.com/

http://hel-looks.com

http://streetpepper.com

http://stylescout.blopspot.com

Systems of living for the Cité du Design

The Cité du Design in Saint-Etienne, France initiated a study to define its own organisation as a multi-dimentional public service in a participative way. The corpus of more than 150 stories collected constitutes a 'collective projection' from which specifications and visualisations of the macro-service Cité du Design were developed.

www.sustainable-everyday.net/citedudesign

Design thinking in MBA Programs

There are more and more new professionals emerging from interdisciplinary master's programs that integrate design, technology, and business to combine creative confidence and analyticability.

http://www.innovation-futures.org/?q=node/293

http://www.aaltoyliopisto.info/en/view/innovaatioyliopisto-info/aalto-university

http://project.hkkk.fi/idbm/index.html

MINATEC / L'atelier Arts et sciences

MINATEC Ideas Lab is a multipurpose innovation laboratory that hosts different companies to collaborate in joint innovation processes. "L' Atelier Arts-Sciences" within MINATEC is an original partnership between l'Hexagone Scène theatre and the CEA research center in Grenoble.

http://www.innovation-futures.org/?q=node/292

www.ateliers-arts-sciences.eu

http://www.ideas-laboratory.com

Software Support Tool for Product Innovation

ECO.officina is a software support tool for product innovation that intervenes as a stimulator of sustainable concepts. The innovation processes is based on the use of environmental criteria to stimulate the creativity for new products.

http://www.innovation-futures.org/?q=node/291

http://209.85.229.132/search?q=cache:zWBpCYL__rsJ:www.cumulusassociation.org/index.php%3Foption%3Dcom_docman%26task%3Ddoc_view%26gid%3D10+carlo+vezzoli+eco.cathedra+talinn&cd=6&hl=it&ct=clnk&gl=it

Conifer / Ethnographic Research Approaches in Design

CONIFER is training a team of industrial designers, marketers, and engineers in ethnographic research approaches, leading them on expeditions investigating their own workplaces, videotaping people using private offices, and coaching them in co-designing new office furnitures solutions.

http://www.innovation-futures.org/?q=node/290

Design Management Journal

Low-cost car from India

'Nano' is a strictly low-cost-design car. By integrating its specific local knowledge and willingness to develop solutions fitting the requirements of people with low income Tata is now in a "pole position" to conquer a major future growth market: low-price cars for emerging countries.

http://www.innovation-futures.org/?q=node/343

On the blog "Die Innovationsmaschine": http://die-innovationsmaschine.de/?p=88

Reverse Innovation

A growing number of Western companies make use of cheap R&D and low-cost manufacturing in Eastern regions and start innovating locally for the domestic market. Afterwards they introduce the innovations to their Western home markets.

http://www.innovation-futures.org/?q=node/347

http://endlessinnovation.typepad.com/endless_innovation/2009/10/innovation-at-the-bottom-of-thepyramid.html

Biotech boom in China

High presence of high skilled local specialists and low costs of research fuel the growth of China as a powerful research establishment. It might be an indicator for China to become a future key-player in biotech and pharmaceutics innovations.

http://www.innovation-futures.org/?q=node/346

China´s jump into the biotech-age: http://www.process.vogel.demanagement_und_it/forschung_entwicklung/grundlagenforschung/articles/112535/

TATA / Creative Thinking Evaluation

Tata makes innovation a key component of it's business by constantly enabling employees to develop ideas through creative thinking. This change of current innovation patterns may indicate a shift of innovation centers from Western to Non-western countries.

http://www.innovation-futures.org/?q=node/345

http://www.tata.com/innovation/index.aspx?sectid=XSZkK5C4qvU=

Business Week: http://www.businessweek.com/innovate/content/aug2009/id20090819_070601.htm

Innovation network corporation

Due to increasing global competition Japan is forced to innovate its once successful business models (e.g high individual R&D spending, keeping high-technology hidden,..). The innovation network shall encourage the promotion of open innovation between Japanese companies and so strengthen domestic competitiveness.

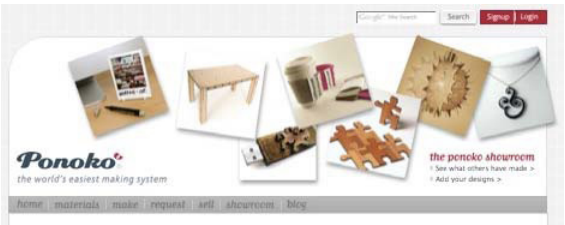
http://www.innovation-futures.org/?q=node/344

http://www.economist.com/displaystory.cfm?story_id=14793432 /

http://www.pcb007.com/pages/zone.cgi?a=51913 /

http://www.incj.co.jp/PDF/090727-02.pdf

PONOKO / Everybody designs



Ponoko is one of the successful projects of 3D product design technologies open to non professionals. It gives the user the freedom to design, create and build (while posing some quite strict technical limits) any sort of object that could reside in his/her mind, even thanks to the new cheaper and advanced laser cutting devices.

Ponoko blog: http://blog.ponoko.com/2009/04/30/dr-neilgershenfeld-speaks-in-manchester-on-fablabs/

BILDR / Building Modular Know-how

An open platform offering access to componentized instruction sets, "building blocks" for making various hardware and software constructions accessible to anybody. It enables the access to the creation of IT systems and application to larger share of the population.

http://www.innovation-futures.org/?q=node/332

http://bildr.org/

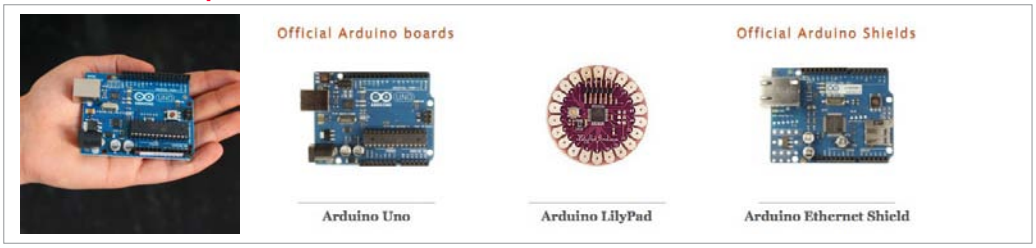
Open Source Car developpement

The Oscar project is trying to develop a car in an open source approach. Thus, the soft and hardware used in the project are freely accessible to everyone willing to participate in the project.

OScar, URL: http://www.theoscarproject.org/

Süddeutsche Zeitung: http://www.sueddeutsche.de/computer/535/321404/text/

ARDUINO / Open Hardware



An open-source electronics prototyping platform based on flexible, easy-to use hardware and software. Intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments it allows the development of standalone interactive objects or objects connected to a host computer.

http://www.arduino.cc

FABLAB / Fabrication laboratory for everyone

Fab labs are small-scale workshops, consisting of several production tools, empowering individuals to create personalised products solving local problems and answering personal needs by themselves. "Fabs" exist already in the United States, South Africa, Ghana, India, Norway and Costa Rica.

Ponoko blog: http://blog.ponoko.com/2009/04/30/dr-neilgershenfeld-speaks-in-manchester-on-fablabs/

Edison / Match-Making for innovators and Companies

An online community dedicated to inventors and people with ideas helping them to turn their ideas into products and companies discovering those ideas. In times of ever faster innovation and product cycles Edison becomes a tool to more user-driven innovations a so far untapped potential of innovations.

http://www.innovation-futures.org/?q=node/340

http://www.everydayedisons.com/default.aspx

24h Innovation Marathon

The Board Of Innovation, an online network of innovators, organised a 24 Hour non-stop marathon of innovation projects around the world. During a full day and night more than 60 participants presented their innovation initiatives in predefined time slots, ranging from small innovation blogs up to large multinationals.

In the Website of the innovation network openinnovators.net, link to an announcement on boardofinnovation.com

In-NO-vation

By emphasizing the 100% natural ingredients and the fact that the product has not changed for centuries the American cereal manufacturer Post goes against the usual day-to-day opinion and growing mistrust in innovation by consumers, who increasingly cherish values, like honesty, trustworthiness, security and ecological awareness.

http://www.innovation-futures.org/?q=node/341

http://www.realinnovation.com/commentary/archive/putting_the_no_in_innovation.html

http://www.mpdailyfix.com/2009/04/when_saying_no_to_innovation_m.html

http://www.youtube.com/watch?v=HUCOXvsgzsg

Real-time Social Search

The Vark social search engine makes it possible to find a person who has the information you are looking for. Using it for posting questions is more effective than posting it in a specific forum, because the social search engine links more people at the same time and acts as a kind of filter, posting the question only to those how might answer them.

http://blog.vark.com/?p=201

Creative Communities for Sustainable Lifestyles

It is a research project aiming at defining new and more sustainable ways of living. The innovation process is based on the idea of looking at social innovation worldwide to collect initiatives in daily living that may inspire new everyday life solutions.

www.sustainable-everyday.net/ccsla

Scientific Open Online Platforms for Widening Researchers Communities

This open environment has been developed to connect members of the worldwide neuroscience community, taking for the first time all the information and data about a mouse brain together. In this way, researchers can create their own views and combinations of data to reveal unique views.

http://wholebraincatalog.org/

http://developers.wholebraincatalog.org/

http://wiki.wholebraincatalog.org

Global Ideas Bank

It is a not-for-profit website that is «part suggestion box, part networking tool, part democratic think-tank and part inspirational entertainment». The innovation process consists in a large open contest where anybody provides any kind of ideas and votes for the best ones.

http://www.globalideasbank.org

E-courses for becoming E-Mentors

An electronic course, in which people from all over the world can exchange their knowledge and help each other to further elaborate their social or environmental project ideas. It is a tool helping to take responsibility for local communities and initiate projects on how to improve environmental conditions, and thereby create new solutions.

http://www.innovation-futures.org/?q=node/335

http://sprout.tigweb.org/

BarCamps

BarCamps designate augmented mixed on-line/off-line workshops that increase the possibilities of interaction between large numbers of participants. It encourages multidisciplinary experts/laymen informal creative interaction in the spirit of social computing.

http://www.innovation-futures.org/?q=node/334

http://en.wikipedia.org/wiki/Barcamp

Immersion in Public Institutions to stimulate Innovation

Territoires en Résidences is an initiative to stimulate innovation and sustainability in public institutions and public policies. It consists in sending multidisciplinary creative teams for long periods of immersion in public institutions on

the model of how residences of artists are organized.

www.la27eregion.fr

www.territoiresenresidences.net

Enabling Cards

It is based on a set of cards representing the different dimensions of a particular social-based solution. Groups of users willing to adapt this solution to their needs and contexts play with the cards to elaborate their personal solution.

Conference of the Sustainable Consumption Research Exchange (SCORE!) Network 10-11 March 2008, Brussels, Belgium

Enabling solutions for creative cities. Improving city life in Milan neighbourhoods through academic projects", Roberta Conditi, Teresa Franqueira;

Design for Social Innovation: Enabling replication of shared mobility initiatives in Brussels, Francois Jégou/ENSAV La Cambre, Belgium; Joelle Liberman/Egérie Research, Belgium; Sara Girardi/ Strategic Design Scenarios, Belgium;

Social Innovation Camps

The Camps are weekend-long events bringing together web developers and designers with people at the sharp end of social problems. These workshops create a space where citizens have the chance to work to solve everyday life problems in collaboration with specialists from different backgrounds.

http://www.sicamp.org/

Social Innovation in Uganda

The Uganda Rural Development and Training Programme launched a vision building program in a rural village. Today, the village has become a «boom town» growing tenfold in size and many new facilities emerging.

Outside Innovation blog, URL: http://outsideinnovation.blogs.com/pseybold/2007/03/kagadiboom_town.html

DOTT / Design To Social Change

DOTT07 (Designs Of The Time) is a series of territorial development projects resulting in a festival that was organized in North-East England in 2007. The whole process can be described as a large participative innovation process about mobility, health, food, school and energy.

http://www.dott07.com

Tata Jagritiyara / Relocate the Young Indian Entrepreneurship to the local scale

An annual train journey that takes hundreds of India's highly motivated youth and experienced professionals on a eighteen day national odyssey to awaken the spirit of social and economic entrepreneurship. The projects idea is to have young entrepreneurs tackling the huge amount of social problems in India.

http://jagritiyatra.com/

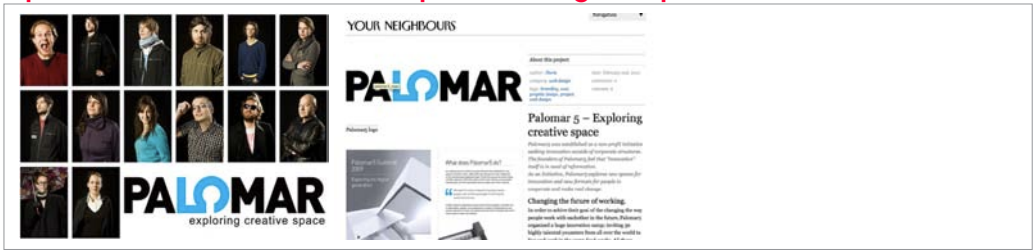
http://2008.jagritiyatra.com/

Activating the neighbourhood

La festa dei vicini di casa (the party of the neighbours form the same condominium): the innovation process consists in providing a toolbox online to help citizens organising their own customised version of a an event that aimed at promoting the idea of neighbourhood amongst citizens

http://www.festadeivicinidicasa.it

Sponsored Innovation Camp for Young People



Deutsche Telekom financed an innovation camp in Berlin where 30 creative young people developed ideas for new working environments that fit the needs and skills of the digital generation.

http://www.innovation-futures.org/?q=node/321

http://palomar5.org/

High Transparency at Dell Idea Storm

Users and interested visitors are enabled to track proceeding stages of all contributions to Dell Idea Storm initiative. In a specific section of Dell's website they are able to access and comment general stats such as the overall numbers of posted, promoted, contributed and also implemented ideas.

http://www.innovation-futures.org/?q=node/284

http://www.ideastorm.com/

Reduced Security Control to Push Innovation

Common business applications online become accessible from a web browser, while the software and data are stored on shared servers. In a keynote Google's former CIO describes innovation culture as offering employees as much freedom as possible to facilitate their working/innovation processes.

http://www.innovation-futures.org/?q=node/294

http://www.technologyreview.com/blog/editors/23916/?a=f

http://www.informationweek.com/cloudcomputing/blog/archives/2009/02 survey_fear_slo.html

Design Randomness software

Breeding Tables is a software which designs infinite number of models for a table with a standardized production process. Randomness is put at the hearth of design process even if final defining pre-production choices are still made by humans.

http://www.innovation-futures.org/?q=node/297

http://www.kramweisshaar.com/projects/breeding-tables.html

Domus n.879, March 2005.

Google / Institutionalising the Free creativity

Google engineers are encouraged to take 20 percent of their time to work on something company-related that interests them personally. This means that «if you have a great idea, you always have time to run with it».

http://www.innovation-futures.org/?q=node/295

http://www.nytimes.com/2007/10/21/jobs/21pre.html

User Innovation Knowledge

MIND LAB is a cross-ministerial innovation unit based at the national Ministry of Finance in Copenhagen which involves citizens and businesses in developing new solutions for the public sector.

www.mind-lab.dk

Crowdsourcing at the White House

An interactive crowdsourcing platform where every American can submit questions about the economy and what the government was doing to get the economy back on track. It is a tool for a more transparent form of politics to enable citizens to participate in and influence several political decisions.

In Jeff Howe´s blog on crowdsourcing: http://www.crowdsourcing.com/

Save our energy

Organized by the city of Munich, this contest pretend to animate as many people as possible to generate and advance innovative concepts on energy efficiency in the fields of mobility, habitation and the combination of both fields. The ideas are commented by other participants and evaluated by experts.

http://www.save-ourenergy.de/start.php?sid=rtwhaachen

Creative Commons

Creative commons is a non profit corporation that offers creative licensing that enables creators to let their creations to be shared, reused and remixed by other people in parts or as a whole in order to generate other innovations still consistent with the rules of copyright.

http://www.innovation-futures.org/?q=node/313

http://creativecommons.org/

Case studies: http://wiki.creativecommons.org/Category:Casestudy?/

Demand for More Open Patent System

A growing support for a more open patent system which limits patent applicability/ duration and emphasizes collaboration and sharing. The aim is to slow down the decline in innovation caused by increasing stakes in intellectual property

especially in areas such as the IT and Life Science sector.

http://www.ethipat.org/

http://www.ffii.org/

http://www.theinnovationpartnership.org/data/ieg/documents/report/TIP_Report_E.pdf

Demand and Supply Driven Innovation Policy

The insight that both demand and supply side factors influence the way innovations emerge and diffuse on the markets becomes more common. The initiative is about to implement a more demand-driven innovation policy that promotes innovativeness and diffusion of innovations by stimulating demand.

http://www.innovation-futures.org/?q=node/315

http://www.gigahamburg.de/dl/download.php?d=/content/publikationen/pdf/gf_global_0901.pdf

Israeli Model / Governmental Supported Start-up

A modern approach to entrepreneurship where a government's venture-capital let foreigners decide what to invest in, and then government provided the needed public money. As a result, foreign venture capital poured into the country, domestic venture capitalists learned from their foreign counterparts and many new jobs and ideas were created.

http://www.innovation-futures.org/?q=node/316

http://www.economist.com/businessfinance/displaystory.cfm?story_id=14743944

Product Piracy Cases

The growing number of cases of product piracy and product imitation reveal an increased threat to business interests and the customers´ security due to deficient products and the utilization of materials with negative health effects.

RBB-Online: http://www.rbbonline.de/was/archiv/was__vom_07_09_2009/produktpiraten.html

Study of the DIHK and APM concerning product piracy: http://www markenpiraterieapm.de/files/standard/China%20Studie.pdf

American Apparel Insourcing

As the largest sweatshop-free clothing manufacturer in the United States America Apparel decided to not outsource any of its activities. By integrating all

aspects of production the company achieves a fast turn-around time from design concept to finished product and creates value by focusing on socially responsible production process.

http://www.innovation-futures.org/?q=node/312

http://en.wikipedia.org/wiki/American_Apparel

http://store.americanapparel.eu/

http://www.businessweek.com/magazine/content/05_26/b3939108_mz017.htm

Top-Secret Innovation

Apple, commonly seen as one of the most innovative brands, treats its upcoming products like a state secret.

http://www.innovation-futures.org/?q=node/311

http://news.bbc.co.uk/2/hi/8162325.stm

http://www.macnotes.de/2009/01/05/mwsf-allesinfos-zum-keynote-ticker-zur-macworld-2009/

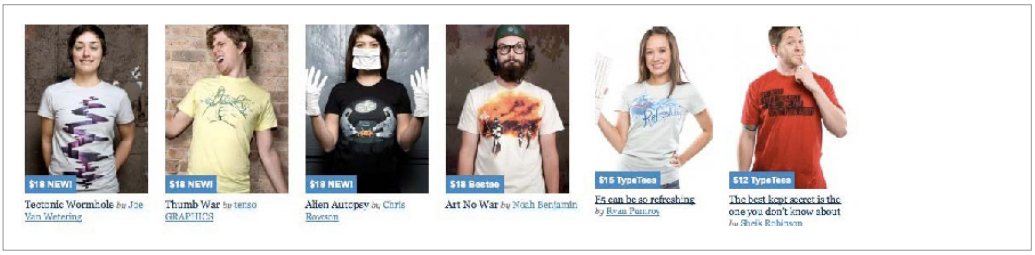
Career and Community Site Creative Professionals

A career and community site hosting individual creative portfolios. It allows young designers to communicate with potential clients and offers a large display of projects and ideas representing a market place of innovations and innovators.

http://www.innovation-futures.org/?q=node/309

http://www.coroflot.com/

Threadless / typetees



Two connected websites where users can submit their designs (Threadless) and slogans (Typetees) to be printed on t-shirts and other formats. By actively engaging the same user that may buy the final product this tool responds growing demand of mechanism to express directly personal creativity in the population.

http://www.innovation-futures.org/?q=node/308

http://www.threadless.com/

http://typetees.threadless.com/

Netflix Open Innovation Contest

The American online video rental shop Netflix has offered 1,000,000 US-dollar for the team able to improve the movie recommendations service made by Netflix's

internal software. Cinematch, by at least 10 percent.

http://www.innovation-futures.org/?q=node/283

In the blog of the innovation platform Atizo.com - link to an article on nytimes.com

CoWorking houses as creative hubs

More and more of the nomadic knowledge workers from the creative class join CoWorking spaces. CoWorking houses offer an easy, flexible and budget workspace combining workspace with a creativity hub.

http://www.innovation-futures.org/?q=node/307

http://www.coworking-news.de

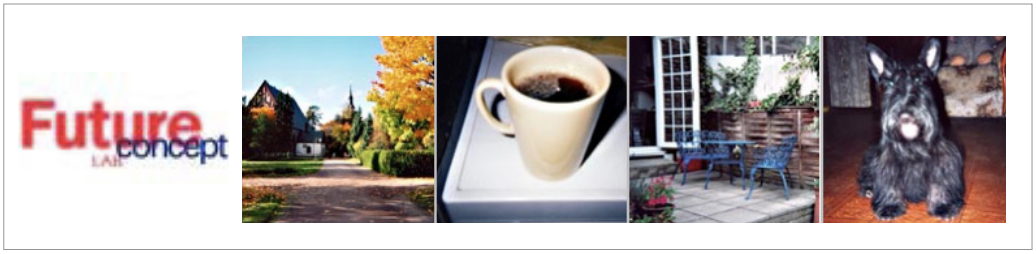
Boom in crowdsourcing

After the financial crisis crowdsourcing marketplaces such as InnoCentive, TopCoder, uTest, and CrowdSpring registered a boom in their activities.

http://www.innovation-futures.org/?q=node/306

BusinessWeek Online: http://www.businessweek.com/innovate/content/jun2009id20090615_946326.htm

Future Concept Lab



An international consultancy focused on global trends in consumption and distribution. The innovation process consists here in activating their original international network of 'cool hunters' worldwide to quickly collect stimulation material on a particular topic.

http://www.innovation-futures.org/?q=node/305

www.futureconceptlab.com

The Rise of Spec-Design sites

A site delivering affordable design works based on an open community of designers competing to create the best possible design to answer the brief usually in as short as 24 hours. Deeply modifying graphic design processes, it is as well widely considered as immoral.

http://www.innovation-futures.org/?q=node/304

http://99designs.com/?tp1=b

http://www.crowdspring.com/how-it-works

The protest group: http://www.no-spec.com/

Wired / Epicenter http://www.wired.com/epicenter/2009/03/iscrowdsourcin/comment-page-2/

Rapid Innovation Testing

Enterprises increasingly use digital and conventional systems to test an ever-growing number of their ideas and thereby increase the probability of finding good solutions and decrease the probability of disinvestments.

http://www.innovation-futures.org/?q=node/298

http://endlessinnovation.typepad.com/endless_inno

vation/2009/09/rapid-innovation-means-rapidevolution.html

http://sloanreview.mit.edu/businessinsight/articles/2009/3/5139/the-new-faster-face-ofinnovation/

Design Council RED – Open Health

This project consists in introducing patients, professionals and interested people's collaboration in order to develop factors of innovation in the health field instead of the traditional «lab research-based» methods.

http://www.innovation-futures.org/?q=node/303

http://www.designcouncil.info/mt/RED/health/

http://www.designcouncil.info/mt/RED/health/REDHealth01.mov

ISEU / Designing energy practices

ISEU standing for «Integration of Standardisation, Ecodesign and Users in energy using products» is a complete user centred innovation process where users are involved into all steps from generating initial ideas, developing them and finally advertising them to their peers.

http://www.innovation-futures.org/?q=node/302

Communication at Energy Efficiency & Behaviours, Maastricht, 19-20 October 2009

Sample Lab / Tryvertising

Located in a very crowded shopping area in Tokyo, Sample Lab! is a store where products are displayed only for demo. Visitors come and try them and get rewarded by taking home some of the products they have tried.

http://www.innovation-futures.org/?q=node/300

http://www.samplelab-international.com/

http://samplelab.jp/

LEGO Digital Designer

Lego Digital Designer is a software created to let users compose their own masterpieces with Lego bricks and elements. In this way, the company delegates the community of user, part of the innovation and marketing process of new products.

http://www.innovation-futures.org/?q=node/299

http://ldd.lego.com/

http://creator.lego.com/enus/Gallery/gallery.aspx

Guidelines for sustainable solutions

Guidelines designed to guide creators and innovation decision to take in consideration the imperative of sustainable development such as sharing of resources, reduction of intensity of transport, intensification of use...

http://www.innovation-futures.org/?q=node/348

Manzini, Jegou, "Sustainable Everyday –Scenarios of Urban Life", Ed. Ambiente, Milan,2003

Cradle-to-Cradle processing

Venlo, a city in the Netherlands, and its 90.000 inhabitants adopted the concept of Cradle-to-Cradle (waste = food) as a vision for their city. This joints the industry with the politicians, the general public and the creative people in a giant common project.

http://www.treehugger.com/files/2008/03/venlocradle-to-cradle.php

http://www.treehugger.com/files/2008/12/cradle-tocradle-exhibition-maastricht.php

Re-design

Re-design is an approach which today regroups designers to conceive products not from rough materials but making use of the huge market of second hand components.

http://www.innovation-futures.org/?q=node/349

Appendix C: Key Factors for the Scenario Construction

Key Factor 1: Global Innovation Centres

The Key Factor deals with global innovation centres. In the past, main origins of innovations have been industrialised and highly developed world regions such as the United States and Japan, followed by the European Union. Today, new innovation clusters, predominantly in emerging regions such as China or India, arise and increasingly play an important role in the introduction and success of innovative products, services and processes.

Four projections (not described in more detail here) have been differentiated for constructing the scenarios: i) Emerging Countries Catch Up, ii) Rapid Shift to Emerging Countries, iii) projection 3: Status Quo, iv) Stronger Position of Europe.

Key Factor 2: Crossover Innovation

The key factor describes to which degree innovation processes will be characterised by cross-functionality, multidisciplinary or transdisciplinarity (in respect to disciplines such as e.g. biology or social sciences), multi-organisational (e.g. between different industries) cooperation and as well as – on a individual level – how much diversity we will see in innovation teams. Additionally, the key factor deals with the effectiveness of such crossover innovation processes.

The following projections have been used describing how this key factor may evolve in the future: i) Crossover Innovation At Its Best, ii) Inefficient Crossover Innovation, iii) Backlash to Crossover Innovation, iv) Status Quo.

Key Factor 3: Impact of Resource Scarcity and Environmental Problems

The key factor describes to which extend the availability resp. the lack of natural resources and the gravity of environmental problems (like global warming) affect future concepts of manufacturing and consumption, thus affecting the underlying innovation processes, too.

The following projections have been used describing how this key factor may evolve in the future: i) Strong Impact: Global Rethinking, ii) Low Impact: Global Waste, iii) Different Impacts: Regional Rethinking.

Key Factor 4: Sustainability and System Thinking

The key factor describes the extent to which the concept of sustainability impacts economic, social, political, as well as innovation-related decision making and acting within the EU. Furthermore, the factor deals with the concept of systemic thinking and illustrates how often sustainability-driven decisions are made and

evaluated under a holistic and systemic perspective.

Three possible development paths (projections) have been distinguished: i) Holistic Perspective on Sustainability, ii) No One Cares, iii) Sustainability Mistaken.

Key Factor 5: Societies' Innovation Capability

The key factor deals with the ability of Europe's society to innovate. The level of innovation capability is set in relation to today and to other world regions. It is mainly determined by social conditions and how major challenges that come along with the demographic change and changing social conditions are mastered – e.g. to what extend the aging population and the youth are both included into innovation processes, and how their potential is utilised.

The following projections have been used describing how this key factor may evolve in the future: i) Life-Long Innovation, ii) Innovation Gap, iii) The Youth Pays the Bill.

Key Factor 6: Peoples' Inno-volvement

The key factor describes European citizens' degree of participation and their willingness/wish to be involved in innovation processes or to innovate on their own. The degree of peoples' "Inno-volvement" is highly depended on their motivations as well as on the availability of innovation-encouraging and particularly innovation-enabling tools and methods. The latter particularly consist of certain innovation techniques.

The following four projections have been used: i) Unleashing the Creative Spirit, ii) Wanted: Innovators, iii) Wasted Potential, iv) Innovation Fatigue.

Key Factor 7: Mediators of Innovation

The key factor deals with the main mediators of innovations and describes which social groups shape the innovation landscape the most. In public perception and common management literature, innovations are the rather exclusive result of commercial activities. However, there are other kinds of innovations, in particular social and process innovations that originate outside the business sphere. They also can lead to new concepts, products and services provided by both companies and social groups. In this context, customer groups, NGOs, citizens, local and central governments, small and big business, as well as transnational bodies can be mediators and organise the innovation process.

The following five projections have been used: i) Society Based Innovation, ii) State Moderated Innovation, iii) Big Business Driven Innovation, iv) Locally Originated Innovation, v) No Mediator.

Key Factor 8: Innovation Facilitating Technologies

The key factor deals with the diffusion of innovation facilitating technologies. Relevant technologies support and facilitate the effective execution of innovation

activities along all steps of innovation processes, from idea generation and evaluation to concept development and finally to market launch. The degree of diffusion primarily depends on the price, the availability, the effectiveness and the operability.

The following projections have been used to construct the scenarios: i) Rapid & Widespread Diffusion, ii) Slow Diffusion, iii) No Diffusion.

Key Factor 9: Welfare and Growth Paradigm

The key factor refers to the prevailing growth and welfare paradigm of the future. The traditional, "pure" growth paradigm is exclusively based on one quantitative indicator to measure social welfare – the gross domestic product. Social welfare is merely linked to material prosperity and monetary value. Ongoing debates involve the consideration of additional qualitative indicators as well, or a general reorientation towards non-material values.

The following projections have been used to construct the scenarios: i) Gradual Paradigm Change, ii) Traditional Paradigm Prevails.

Appendix D: How can you use the INFU findings? A guide for organising a workshop

The INFU research project generates a series of stimulating material to support the strategic conversation among stakeholders about the future of innovation. It has been used within the research process as well as outside to generate workshops and seminars offline and online between experts, scholars or general public. The purpose of this appendix is to review the main material made available by the INFU research project and suggest possible usage to organise further workshops.

The guide is presented in a practical handbook manner through a series of pictures showing the different material referred to, contexts of use in workshop or exercises, each of them with a caption suggesting possible application. This setting intends to be open. It should not be applied exhaustively. On the contrary, it needs to be reorganized and filtered in order to match the needs and goals of each specific context. Workshops can be organized for each particular setting using the material to guide them.

In order to better illustrate possible use of the INFU material the programme for a typical workshop is presented hereafter ad a stimulating suggestion to be adapter.

WORKSHOP PROGRAMME

Part one / Presentation of the INFU findings

1.1 / Warming up of the participants discussing evidence of changing innovation pattern (see material point 1, 2 and 3)

1.2 / Presentation of the INFU Amplification trailer and overview of the visions generated (see material point 4, 5 and 6)

1.3 / Presentation of the INFU Mini-panel trailer investigating more in-depth the visions and overview of the scenarios generated (see material point 7, 8 and 9)

Part two / Discussion of INFU material

At each steps a simple plenary discussion could take place between the participants to enable a better appropriation of the INFU material. Exercises could be proposed also to improve and complete the material, adapt or test it against local context or specific stakeholder point of view.

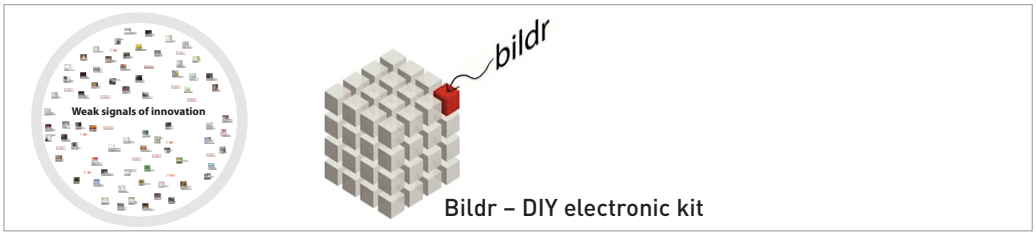
In particular the following point should be discussed:

2.1 / Discussion of barriers, enablers, opportunities and threats along the different dimensions of change (see material point 10 and 11)

2.2 / Discussion of implications (general/local/sector specific...) in relation to specific visions or scenarios (see material point 10 and 11)

Part three / Policy measures

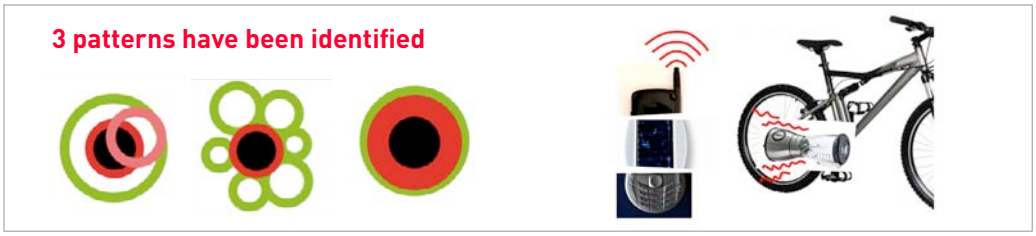
3 / Analysis of the current strategies and development of measures.



1_Evidence of changing innovation patterns has been collected. They constitute stimulating material to kick-off a discussion or creative session on innovation.

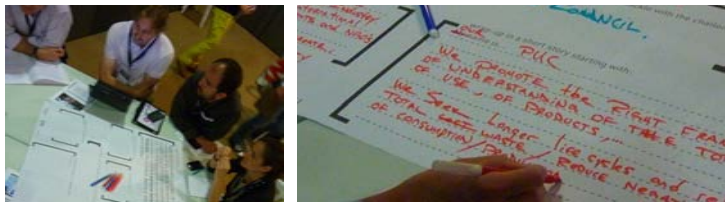
2_They are available in different forms from detailed description on the INFU website (http://www.innovation-futures.org/?q=taxonomy/term/29) to shorter illustrated snapshots organized in a dynamic mind map way (http://www.innovation-futures.org/?q=node/360).

3_The catalogue of evidences of changing innovation patterns can be turned into a deck of synthetic cards and used as an ice-breaker to start the conversation in a subgroup workshop setting. Cards are useful as a means to be exchanged, compared, sorted by participants according to their potential as emerging trends and used in all sorts of games combining these emerging signals of change.

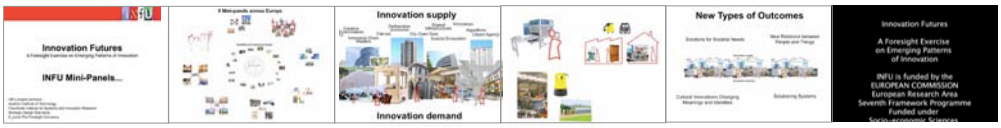


4_The evidences of changing innovation patterns can be used in particular in relation to an extrapolation or amplification exercise. This exercise will encourage participants to imagine how innovation panorama would look like if one specific pattern would become the norm.

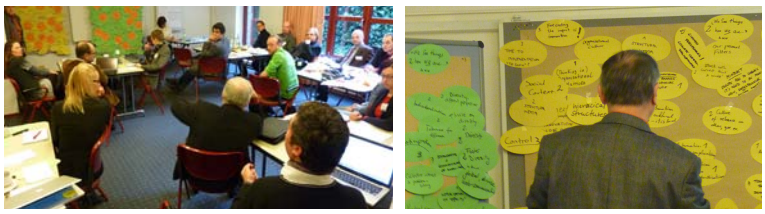
5_A short 10 min. trailer is available on the INFU website (http://www.innovation-futures.org/?q=node/359) explaining the process of creative extrapolation starting from a series of changing innovation patterns to amplify them and generate various and contrasted visions of innovation future. The panorama proposed through the trailer can be simply discussed by workshop participants or further developed generating more visions.



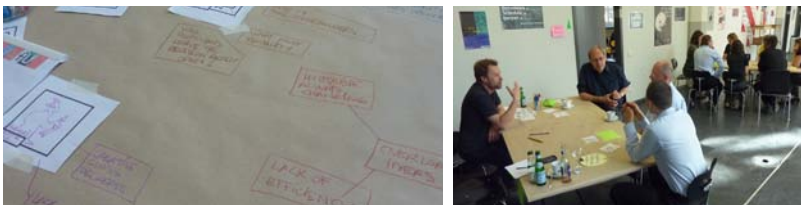
6_A series of challenges relative to innovation externalities, rhythms, economical issues, social impacts or citizens engagement have been produced as another way to tease the future of innovation in a creative way. Participants gather in subgroups around tablecloths printed with questions around actors' roles and the ways they may innovate to tackle with the challenges.



7_Each of the particular amplifications proposed by the INFU research project opens up a field of investigation in itself. Specific mini-panels have been organised by experts and interest groups and their in-depth investigations can be reviewed in another 10 min. trailer (http://www.innovation-futures.org/?q=node/358) that can be used in total or in parts to stimulate debate in workshop.

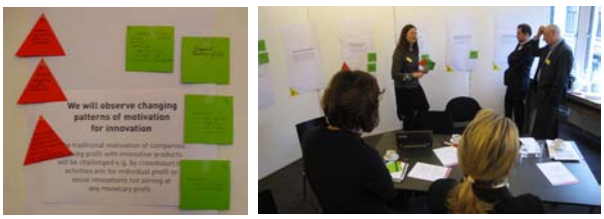


8_Scenarios have been developed picturing different possible recompositions of the innovation panorama within foreseen trends and evolutions of the strategic environment. They constitute each of them framework hypothesis in which specific sectors strategies or actors roles can be projected in a workshop and discussed.



9_Assessments of the mini-panels and scenarios results have been conducted and similar exercises can be organized in workshop sessions in particular exploring positive implications and negative implications of each of the visions emerging from the mini-panels in-depth investigations or projections within scenario frameworks.

10_Dimensions of change of innovation patterns have been finally synthesized from the INFU research project process (see chapter 6 of this document). They constitute the main lessons learnt to be discussed with policy makers involve in innovation at local, national and European levels.



11_The dimensions of change can also be the core topics for workshop activities prompting participants to comment each dimension in terms of barriers and enablers, opportunities and threats, implications for current policies and challenges to be covered by new ones.

Innovation Futures: A Foresight Exercise on Emerging Patterns of Innovation. Visions, Scenarios and Implications for Policy and Practice

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