

Scenario Assessment Report

Deliverable D 5.1 (WP 5)

Final version, November 2011



The INFU Project is funded under the Socio-economic Sciences and Humanities

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Contract No. 225229
Starting date: 1 June 2009
Duration: 32 months

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1 Introduction

The INFU project has progressed from an initial collection of signals of change in ways of doing innovation¹ via amplifications² and Mini-Panel Visions³ to fully fledged scenarios of future innovation landscapes⁴. From all these Foresight activities, nine dimensions of change in innovation patterns emerged. In this report we point out opportunities and threats emerging from these changes in innovation patterns for three different realms that are pertinent to the quality of life of European citizens:

- living and working conditions, social fabric (society)
- business environment (economy)
- quality of the earth's ecosystems (ecosystems).

The assessment is based on insights from the INFU visioning and scenario building activities and two assessment workshops⁵. One 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.⁶ The main INFU scenario assessment workshop took place in Karlsruhe on 23rd of May 2011. As the scenarios were dominated by macro-level aspects, the workshop did not – as originally envisaged – examine the full scenarios but focussed on the underlying innovation patterns. A world-cafe setting was used to assess negative and positive implications of these innovation patterns.⁷

In this report we discuss the resulting assessments along the nine dimensions of change in innovation. These dimensions of change are common patterns and underlying features of the developed innovation visions of the INFU project. Section 2 gives a short summary of these dimensions. In section 3 the assessment of opportunities and threats for society, ecosystems and business are discussed along these dimensions of change. Section 4 sketches overarching observations with a view towards the next INFU work package that is exploring implications for policy strategies. The Annex provides a detailed documentation of the scenario assessment workshop.

2 Dimensions of change in innovation patterns

The INFU foresight exercise on future innovation landscapes has pointed towards the following relevant dimensions of change in innovation patterns (which also can be referred to the scenarios developed within INFU):

- **Mediation and Coordination:** The position of companies as *the* main mediator between innovation demand and supply is challenged by several new innovation patterns. Other coordination mechanisms such as web based co-design are on the rise (for advancements of collaborating tools, see Scenario 1⁸: “Unleashing the Creative Spirit”). This is connected to the rise of new actors and stakeholders in the innovation

¹ INFU Deliverable 1.1 Signals of Change in Innovation

² INFU Deliverable 2.3 Amplifications

³ INFU Deliverable 3.1 Innovation Future Scripts

⁴ INFU Deliverable 4.1 INFU Scenario Report

⁵ See <http://liftconference.com>

⁶ The documentation can be found at <http://www.strategicdesignscenarios.net/innovation-futures-workshop-at-lift-2011/>.

⁷ For a detailed report of the workshop see Annex I.

⁸ For this and all the following references on the INFU scenarios cf. Deliverable 4.1 INFU Scenario Report.

process of the future (for the increasing role of Cities as mediators, please see Scenario 3: “Locally Driven Innovation”).

- **Participation:** Citizens seem to gain relevance in innovation, both in deciding on innovation priorities and in contributing to the innovation process (for an idea how this could boost new solutions on the local level, see Scenario 3). Finding the right level and instruments to enable this kind of co-creation of solutions seems a crucial future challenge (Scenario 4: “Prometheus Unbound” names a large number of “wisdom of the crowd” approaches).
- **Infrastructures:** New innovation enabling infrastructures will emerge alongside with new innovation formats. In particular, enabling infrastructures for community innovation such as the innovation camps, shared fab-labs and co-working spaces are likely to become more important. In addition, virtual/digital global infrastructures may increasingly be required (Innovation infrastructures play a vital role in all scenarios, particularly in Scenario 1 and Scenario 3)
- **Eco-Innovation:** Innovation patterns with reduced negative impact on ecosystems are gaining relevance, too (in Scenario 1: “Unleashing the Creative Spirit”⁹, sustainable innovation help the European Union to cope with many of the challenges, which lay a head of us, while Scenario 3: “Locally Driven Innovation”, demonstrates how small-scale changes at the local level can make a big impact). In particular, three interrelated aspects are important:
 - System innovations fostering transition towards sustainable patterns of production and consumption.
 - Immaterialising innovation enabling the fulfilment of human needs with immaterial means such as relational innovation, social innovation and virtual innovation.
 - Innovation fostering circular resource flows (cradle to cradle innovation),
- **Spatial shifts:** Innovation will change its spatial patterns. Local elements are likely to gain relevance resulting in a more distributed innovation scenery (compare also with Scenario 3). At the same time web based innovation is changing the notion of proximity (see Scenarios 1 and 4).
- **Automatisation:** Software will play an ever-growing role in innovation. More and more innovation steps may become automatised (Scenario 2 puts a spotlight on how automatising innovation processes could help mitigate Europe’s Brain Drain, however, also stressing that it could hardly replace the “human factor”).
- **Interpretation:** The very meaning of innovation may be shifting. Changes in social relations may become widely recognised as prime innovation target. Notions of identity formation and everyday creativity may increasingly be recognised as core aspects of innovation. Creativity may become a key aspect in all professional activities. (For Innovations for innovation’s sake but also the spread of innovation to all aspects of peoples’ everyday lives, please see Scenario 4: “Prometheus Unbound”.)

⁹ The four scenarios are described in the INFU Scenario report D4.1

- **Education:** Education and innovation are closely tight 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 change in innovation patterns will be driven by new forms of learning and identity forming. (Scenario 1: “Unleashing the Creative Spirit” demonstrates how education could play a crucial role in stimulating a new way of thinking and learning.)
- **Motivation:** Company profit as the main driver of innovation activity is being challenged. On the one hand individual persons are increasingly seeking to generate profits of their own as well as individual pleasure by contributing to distributed innovation activities such as crowdsourcing initiatives, idea competitions or open source communities. At the same time social innovations that are not primarily directed at immediate monetary benefits but at providing solutions for social needs are more and more recognised (social innovations are especially featured in Scenario 1: “Unleashing the Creative Spirit”, in which creative commons become the norm, as well as in Scenario 3: “Locally Driven Innovation”, in which community initiatives provide innovative solutions to social problems that companies were not able to develop).

3 Assessment of changes in innovation patterns

3.1. Implications for society

The “innovation society” that could emerge from the new innovation patterns may be stimulating, sustainable and inclusive if all the opportunities are taken up. In such an “innovation society” systemic solutions for societal challenges may well be encouraged by participative processes and immediate feedback loops of innovation processes with a local focus. Decentralised people empowered innovation infrastructures may allow for better transparency of socio-ecological impacts and more adequate products and services. On the other hand there is the risk that hyper-innovation will lead to an ever changing / never working system especially challenging for specific societal groups. Constant innovation without an infrastructure providing procedures for access, assessment and selection may well pose threats to social cohesion and efficiency of innovation processes. If constant innovation activity is based on automatised innovation, this could lead to a loss of creativity and variety in society and the dominance of incremental improvements without radical and systemic innovations. Innovation patterns based on local circular resource flows could lead to a new “materialism” where the value of resources is much more appreciated than today. At the same time these developments hold the risk of a “waste divide” across society with deteriorating working conditions for many jobs.

The table below lists the assessments of negative and positive implications for society arising from the dimensions of change¹⁰ identified in INFU.

Opportunities

- Radically open, participatory innovation landscapes will allow for the empowerment of

Threats

- Many requests for time demanding participation in innovation processes and

¹⁰ The dimensions are indicated in brackets at the end of each paragraph.

citizens, employees and customers, foster creativity and idea generation, strengthen democracy, induce more human policies and lead to a recursive ,innovation‘ society which is self-stimulating, sustainable and inclusive. Radical innovations will be encouraged as people are ready to take bolder risks (participation, infrastructures).

- With the emergence of everyday creativity the gap between business and private life may shrink, job satisfaction increase, professions become “vocations” and value creation become value appreciation. Education and training may benefit from a renewed emphasis on creativity and intuition (interpretation, motivation).

- Automatised innovation processes may not only support individual employees by reducing the pressure to be creative and by setting free capacity for radical innovations. In particular in aging societies algorithms may become a valuable support (automatisation).
- Algorithm-based innovation may underpin the handling of complexity and thereby support a transition towards improvements of society as a whole. With automatised innovation processes it might become possible to map the unknown and to better meet consumer needs and preferences (automatisation).
- Even political decisions could become more transparent and based on extensive simulation of effects on the whole system. Abuses by policy makers may become more transparent (participation, automatisation, motivation).

heavy responsibility may result in a participation fatigue (participation).

- Society may suffer from an overload of ideas without adequate mechanisms of processing, filtering and implementation and a lack of standardisation and legislation. A permanent state of experimentation may induce an ever changing / never working system, especially challenging for the elderly (coordination, infrastructure).
- Companies externalising the risks that are connected with innovations by using open innovation approaches might not compensate the innovators sufficiently. This might lead to the emergence of the “creative poor” (coordination, participation).
- High emphasis on innovation may result in innovation becoming a pressure for employees. Hyper-innovation can produce disappointment and uncritical rejection and thus ultimately hamper innovation (interpretation).
- Discrimination may occur between small elites with time, attitudes and resources available to participate, and 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” (participation, mediation).
- Time demanding systematic participation processes slow down the dynamic of development of public services (participation, infrastructures).
- A specific risk connected to automatised innovation but also to 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 on the society and to reduced product quality. Privacy concerns may lead to information hiding and closure (automatisation, participation).
- Artificial intelligence needs to be controlled when values are involved and when tightly coupled to systems with significant impacts (infrastructures, automatisation).
- Superior knowledge of few IT-experts may lead to a concentration of power dividing society (education, automatisation, infrastructure).
- Algorithm-based innovation may lead to a

- Cradle to cradle elements in innovation patterns may bring about 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. These paradigms will enforce collaboration across professions, disciplines and generations (education, eco-innovation).
 - Localised participatory innovation settings may foster connectivity at neighbourhood level and bring about shared values, positive energy and thus enhance social cohesion and safety (spatial shift of innovation, participation).
 - 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 breakthrough systemic solutioning for societal challenges. The role of consumers may be transformed towards the “citoyen” or even “local club member” (spatial shift of innovation, participation).
 - The change of policy maker’s role from “decision maker” towards participation facilitator, animator, moderator, and stimulator will foster more problem oriented politics. The focus on the local level may ensure a more practice oriented education (spatial shift of innovation, infrastructure, participation).
- lack of diversity in innovation. Consumers are locked in a bubble which is defined by their initial preferences, because information supply is automatically customized to the assumed preferences (automatisation, education, infrastructures).
- Innovation patterns with a high emphasis on resource reuse carry the risk of deteriorating working conditions. The number of low wage jobs with unhealthy working conditions may multiply or else a global “waste divide” may emerge with some countries up-cycling the others’ waste (eco-innovation).
 - Conflicts with current cultural norms and consumption patterns are likely. Reuse concepts may appeal only to specific elitarian groups of society and thus undermine cohesion (education, eco-innovation).
 - Local innovation patterns carry a risk of communitarism and localism. Collective resource pooling may become difficult as well as addressing global aspects. Radical breakthrough innovations may be hampered in favour of incremental improvements (spatial shift of innovation).
 - Explosion of ideas and projects on a local level without catalysts, boundary spanners, mediating platforms and adequate information sources may lead to inefficient processes on a macro level (spatial shift of innovation, infrastructure, coordination).
 - The open innovation city may be a very vulnerable system that is easy to hack. It may be attacked e.g. by mafia-like organisations (spatial shift of innovation, infrastructure).

3.2 Implications for economy

New opportunities for business activities in Europe can emerge based on the speeding up of the innovation process and increased efficiency and effectiveness that might be achieved by open innovation, crowdsourcing and automatisation of innovation. The efficiency gain may compensate for high wage structures in Europe and increase the competitiveness of companies in Europe. SMEs might be best positioned to take up business possibilities in a constantly changing business environment with a focus on local innovations. Diverse opportunities for SMEs and start up companies will arise because of new business models and

new “power structures” within the innovation system. “People empowered” decentralized business models might challenge today’s big companies but offer new business possibilities for start up companies. Companies relying on traditional strategies for the protection of their knowledge base may hence have difficulties to cope with such as 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 marketplaces. These open innovation marketplaces offer the possibility for companies to externalize risks that are linked to innovations. New infrastructures will be needed to ensure that creative innovators and SMEs are compensated for taking up the risks. This could lead to high ratio of emerging and disappearing innovative SMEs. Hyper-innovation might impose an “innovation imperative” on the companies, being the only possibility to survive. Finally, the IT dependency that might arise if innovation processes to some extent become automatised can reduce diversity and creativity and therefore hinder the possibility to define a unique selling point.

The table below lists the assessments of negative and positive implications for the economy arising from the dimensions of change¹¹ identified in INFU.

Opportunities

- Open innovations marketplaces offer the possibility to externalise the risks that come along with innovation processes (mediation and coordination, infrastructure, participation).
- The emergence of widespread creativity provides several positive aspects for companies: Creation of an idea-pool, speeding up of the process and probably also risk reduction, due to better ideas from the crowds or from creative employees. New business models will arise along with new mediation and coordination mechanisms between the “idea pool” and the demand side (coordination, infrastructure).
- With 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 & services and the merging of different fields can enable breakthroughs and thereby speed up the innovation process. Improved testing facilities will prevent failures. The reduction of effort required in the early phase of innovation will lower the threshold for innovators and shift emphasis towards succeeding steps in the innovation chain (automatisation).
- Some of today’s barriers of profit-oriented

Threats

- A landscape of extremely widespread and over boarding creativity may pose some challenges for companies: Patterns featuring extreme flexibility of value propositions and complete openness of “innovation marketplaces” in particular when combined with erosion of collective values may pose a threat to business. Due to lack of stability permanently changing companies may struggle in forming an identity. Moreover, a number of individuals may be competing in crowdsourcing activities under high pressure and low quality working conditions (interpretation, infrastructure, participation, coordination).
- With increasing uptake of automatised innovation patterns traditional firms will struggle to redefine business models and unique selling points. In addition there is a risk that algorithms will run out of control and the integration of ethical aspects will be difficult. 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. Disapproval of automatised innovation might lead to an “innovation fatigue” hindering business opportunities (automatisation, education).

¹¹ The dimensions are indicated in brackets at the end of each paragraph

- product innovation will disappear. Traditional economic “power structures” may erode due to easy transfer of algorithms and absence of patenting. The open source society will offer new opportunities for start up companies requiring less start up capital (coordination, infrastructure).
- The dematerialisation of products and the transfer of innovation algorithms may bring about new business models for start up companies (automatisation).
 - 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. Tighter boundary conditions will lead to an explosion of creativity (eco-innovation, spatial shift of innovation).
 - Localised innovation patterns such as open innovation platforms installed on a city level may cater for a number of new business models such as development of 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 (eco-innovation, spatial shift of innovation).
 - If innovation activities are shifting towards social innovations, traditional product innovations may become less important and less accepted by customers, companies might experience problems to generate profits with innovative products and services (motivation).
 - Speeding up of the innovations process combined with the ease of copying software algorithms might lead to difficulties in protecting intellectual property rights (IPR) in a globalised world (infrastructure, automatisation).
 - Extreme reuse oriented patterns carry the risk of emerging shadow-economies with strongly negative consequences for the market and companies. Standardisation of such patterns will be challenging and problems with warranty and liability are likely to emerge (eco-innovation, infrastructure).
 - Circular economy innovation elements are conflicting with the growth paradigm that is currently dominating global economies. If the concept is not implemented on a global level, the respective countries’ and companies’ competitiveness will suffer (eco-innovation).
 - 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. The access to global markets and the launching of global products may become much more difficult (eco-innovation, spatial shift of innovation).

3.3 Implications for ecosystems

In the past, innovation has had mainly negative impacts on the earth’s ecosystem due to the linkage of economic growth and resource use. Future innovation landscapes provide some opportunities for reversing this situation. More resilient systems with sustainable long-term solutions may arise and finally enable decoupling of innovation from resource consumption. Innovation patterns that preserve rather than deplete the ecosystem might be the only

possibility to keep an economy alive that is fuelled by permanent innovation. New innovation patterns might support the ex-ante assessment of complex systems and thereby reduce unexpected negative socio-ecological effects. Value changes towards sustainable consumption patterns may occur along with some new innovation patterns based on participation and localisation. Emotionally appealing new innovation approaches such as the cradle to cradle concept may trigger wide participation and value change. At the same time, without a value change a speeding up of the innovation process may bring about even more material intensive consumption processes with accelerating deterioration of ecosystems services. It is still an open question whether participative approaches can foster long term systemic innovation that require giving up some of today's privileges. The table below lists the assessments of negative and positive implications for ecosystems arising from the dimensions of change¹² identified in INFU.

Opportunities

- The wide spreading of creativity (ubiquitous innovation) 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 (perception of innovation, participation, motivation).
- Opening of innovation patterns towards contributions and assessments from many actors improves context specific relevance of innovations and assessment of ecological soundness. Rebound effects are reduced through close interaction between innovation promoters and opinion leaders (participation, mediation and cooperation).
- Increasing use of powerful algorithms allows for more accurate assessment of complex systems. This will bring about new ways of testing and measuring ecological impacts and simulation based evaluation of policy measures with respect to environmental impact (automatisation).
- As simulation processes will require fewer prototypes and many products will remain virtual only consumption may require less resources and waste will be reduced (automatisation).
- Innovation patterns focussing on reuse 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

Threats

- Wide spread creativity and excessive emphasis on new products and ideas could speed up innovation processes and shorten product lifecycles, so a more material intensive world is created with the number of unnecessary, unsafe and unreliable products and amount of waste exploding (perception of innovation, participation).
- Participatory process (e.g. deliberative innovation) might hinder long term transition towards a more sustainable ecosystem because negative short term effects on an individual level are not accepted by the majority or at least some parts of society (participation, perception of innovation).
- Software based innovation patterns in particular when directly coupled with production or financing systems may bring about a kind of cancer economy with unlimited generation of ever new products at (risk of creating „8 million customized unicorns“). At the same time radical systemic innovations as they are required to reorient societies may be hampered by the paradigm as automatised solutioning will foster a preference for easy solutions. The driving role of fashion towards ever more consumption could be strengthened (automatisation).
- Cradle to cradle innovation patterns may lead to lock-in into 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

¹² The dimensions are indicated in brackets at the end of each paragraph

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 softened (eco-innovation, education, motivation).

- People might be attracted by the radical and positive cradle to cradle approaches and therefore support policy makers to reframe the sustainability transition by launching more radical legislation and the uptake of new focus areas for RTI policies. Low-tech innovation and experimental research will become more popular (eco-innovation, infrastructure, education, motivation).
- Localised innovation patterns (e.g. city-driven innovation, deliberative innovation) allow for local resource flows and thereby reduction of transport. Governance of consumption patterns towards sustainability becomes easier as people are more aware of local resource flows (spatial shift of innovation).
- Local participatory innovation patterns (e.g. City-driven Innovation, Deliberative Innovation) in particular at the level of cities enables positive resonance between human and technical systems and thereby breakthrough systemic eco-innovations. The local niche level may function as a test-bed for systemic solutions on a global scale (spatial shift of innovation, participation, motivation).


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 on waste avoidance (eco-innovation, spatial shift of innovation, infrastructures).

- New “eco-products” could lead to the prolongation of the existing consumption patterns, hinder a value change in society at become a barrier of transition processes (eco-innovation).
- 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 focussing on the city scale but insufficient consideration of what happens to the ecosystem on a global level (spatial shift of innovation, motivation).

4. Outlook

For each dimension of change in innovation patterns identified by INFU, the assessment process has highlighted threats and opportunities for society, ecosystem and economy. Obviously, much depends on the way the change will come about. In many cases positive implications heavily depend on the **acceptance or even active support of the society** or at least of specific parts of the society. Future innovation landscapes with a number of positive implications for society, economy and environment alike such as the vision of the “open innovation city” require the explicit support and involvement of different groups of the society. The same holds for automatised innovation. This pattern may well emerge without any deliberate participation.

However, a societal rejection could lead to people deliberately hiding their personal data and thereby hinder the expected transparency gains. At the same time all newly emerging innovation patterns are influenced by **strong external driving factors** such as demographic change, globalisation and climate change. These drivers might enforce new innovation patterns without a deliberate societal decision in favour of these patterns. Scarcity of



resources and the availability of personal data in the internet are only two of these developments that might drive the emergence of new innovation patterns. In this context it is especially worth noting, that for all visions the **risk of societal 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 parts of the society may lead to exclusion of specific groups of society from the innovation process. In this case new innovation patterns will bring about short term benefits for specific groups but at the same time negative side effects for the system as a whole. We are thus 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. The next INFU work package will need to explore inroads for respective policy strategies.

5. Annex: INFU Scenario Assessment Workshop - Documentation

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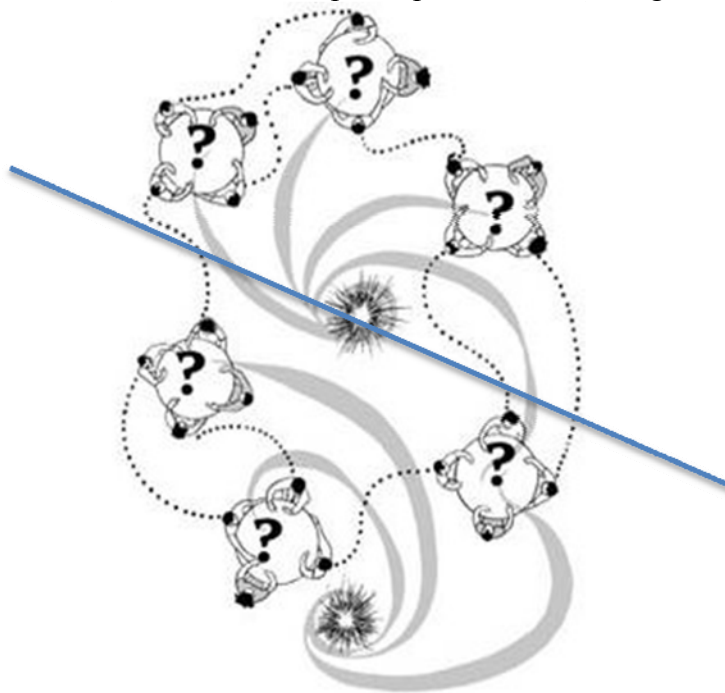
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1. Background

The aim of the workshop was to explore how newly emerging innovation patterns may impact on the quality of life of citizens in Europe and beyond. More specifically the discussion focussed on implications for society, economy and ecosystems. For this purpose, actors with expertise on these three aspects of quality of life jointly discussed opportunities and threats emerging from some of the scenario elements on the future of innovation that were developed by the INFU project. The documentation summarizes the assessments for each “innovation future” (chapter 3) and then outlines the findings on two overarching aspects ecosystems and companies in chapter 4. The presentations of the Innovation Futures given by the INFU team and provided as a handout at the World-Cafe-Tables can be found in chapter 5.

2. Methodology

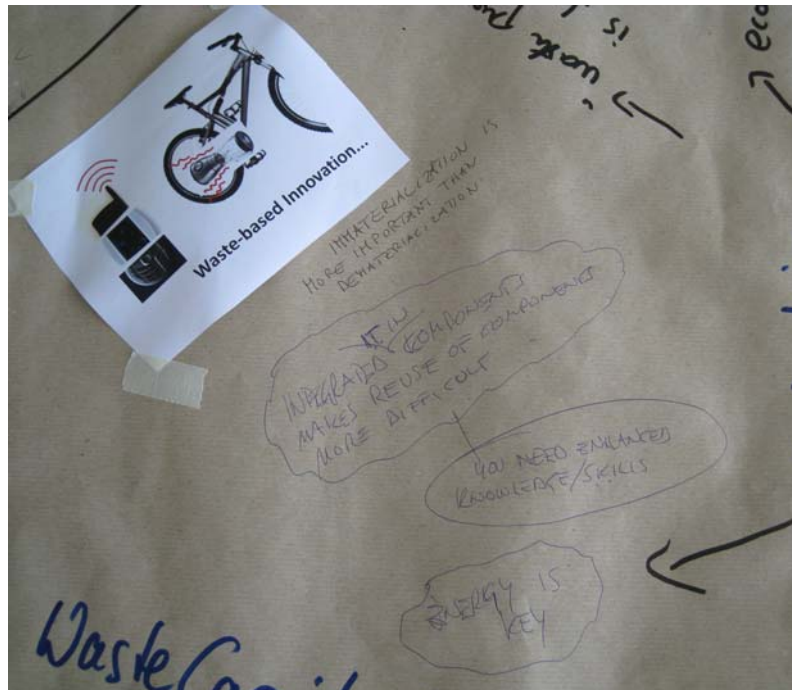
The INFU Scenario Assessment Workshop was carried out as a World Cafe combined with the approach of the Walt Disney method. Two tables were placed in an inviting environment two others in a rather cold and uninspiring setting. The first two tables were used to discuss the positive implications of the INFU Innovation futures on society, economy and ecosystems, whereas at the other two tables participants discussed negative consequences.



Tables were changed after 20 minutes until all participants had assessed positive and negative aspects for all four Innovation futures: Waste-Based Innovation, Open-Innovation-City, Automatised Innovation and Creative Spirit. In the end table hosts presented summaries of positive and negative implications for each innovation future. Two participants presented findings on companies and ecosystems across scenarios. The agenda can be found at the end of the documentation.

3. Assessment of Innovation Futures

3.1. Innovation Future - Waste-Based-Innovation



Waste-Based Innovation Summary

The “waste based innovation” landscape comprises three core systems:

- The On Demand Economy - Waste is significantly reduced through producing only in accordance with demand.
- The Access Culture - An autonomous distributed network, working to provide everyone with access to knowledge, tools and resources they need to improve their lives and environment.
- The Surplus Ecosystem - A parallel social system that treats waste (Surplus) as material resource and exchanges its own Surplus (new/upcycled products) with society.

The workshop focussed on the Surplus Ecosystem which is characterised by three infrastructures:

- *Waste Mines* provide access to waste resources
- *Material labs* where Material Experts combine and separate organic and synthetic materials to create products which can be more easily disassembled through composting. Material Labs store and extract resources from waste - continuously experimenting with new methods of extraction and disassembly. Material Labs often can be found close to Fab Labs in relevant scales, providing complimentary services.
- *Scalable Network of Fab Labs* where people are enabled to produce their own products. They operate at hyper-local, community, and global scales. Local Labs,

Factories, and Home Labs all provide different levels of commercial and social engagement.

The archetypical people of the Surplus Ecosystem are the “Surplus Sufficientes”. They view waste as surplus - just a resource that there is too much of that needs reallocation and re-evaluation. Surplus Sufficientes constantly mediate between waste providers and users. They are highly valued by industries and businesses looking to improve their own resource management, as their knowledge base, networks and behaviours make them well equipped to identify new opportunities. There are two types of Surplus-Sufficientes-Specialists: Hunter-Gatherers focus on food and Space Invaders focus on territories

Workshop Findings: Opportunities related to of Waste-Based-Innovation

- Consumers
 - Turn towards value oriented buying and knowledge based choice making
 - acceleration and faster solutions
 - Emergence of POSTSUMER (characterised by system’s thinking)
 - Emergence of frugality thinking
- Design and engineering
 - competence building in design & engineering for remanufacturing
 - rediscovery of waste-free “innovation roots“
 - creativity boom
- Policy
 - Because of the radical, positive approach actors may be attracted to this paradigm. It may be an opportunity for policy makers to reframe the sustainability transition in a attractive way for various actor groups
 - Opportunity to spur new legislation
 - New focus areas for RTI policies:
 - new materials
 - low-tech innovation
 - experimental research
- Society
 - Emergence of new values, competencies and infrastructures required for an eco-consistent economy (emergent materialism)
 - Emergence of new professions partly highly skilled craftsmanship
 - restructuring of markets
 - development of an interdisciplinary culture
 - integration of elderly, revival of traditional skills
- Companies
 - cost reduction due to no / low waste
 - earning multiple times due to re-cycling (-low tech) as cash cow
 - greening of industry according to „cradle to cradle“
 - new companies
 - new sectors for agile SMEs on a local scale
 - new sectors / services --> agencies, mediators
 - cross-professional processes
- ecology
 - desaturation of landfills
 - gain land after cleaning
 - GREENER WORLD

Workshop findings: Risks related to Waste-Based-Innovation

- Society
 - Exploitation of employees (low skill/low pay waste jobs)
 - Unhealthy working conditions
 - Limits to innovation and creativity
 - Emergence of shadow waste economy
 - Global waste divide
 - Criminal waste hunting
 - Emergence of waste mafia
 - Contradictory design incentives
 - Conflict with current demands
 - Concept may appeal only to specific societal groups
 - Societal divide
 - Waste related activities may become stigmatised
- Culture
 - Waste paradigm is alien to current culture --> habit of collecting everything, Waste burger is disgusting!
 - Focus on death rather than birth/creation
 - If this is not a global paradigm Europe may be stigmatised: „old Europe with its waste products“
- Politics
 - Standardisation is challenging
 - Warranty aspects likely
 - Liability problems
 - Conflicting with existing tax system
- Ecology
 - if waste based products are trendy then cheap fakes will come up
 - products become more expensive and less durable due to recycle fatigue
 - Waste based innovation \neq sustainable living (example H&M sells shirts made of recycled plastics (now! today))
 - Value-creation concepts at macro-level are missing
 - Waste is a limited resource
 - Immaterialisation is more important than dematerialization: Danger of being locked into intermediate step
 - bad/dirty products are recycled, shopping life style is sustained, enviromental footprint is not really reduced
 - rebound effects
 - transport increase, rubbish rush-hour
 - less waste- but: more energy and fresh-water use
 - increased IT in components makes reuse of components more difficult
- Economy/Companies
 - Negative impact on GDP (current definition) --> makes sense for 5%
 - Conflicts with existing growth paradigms
 - Product centred: no attention on the political dynamics

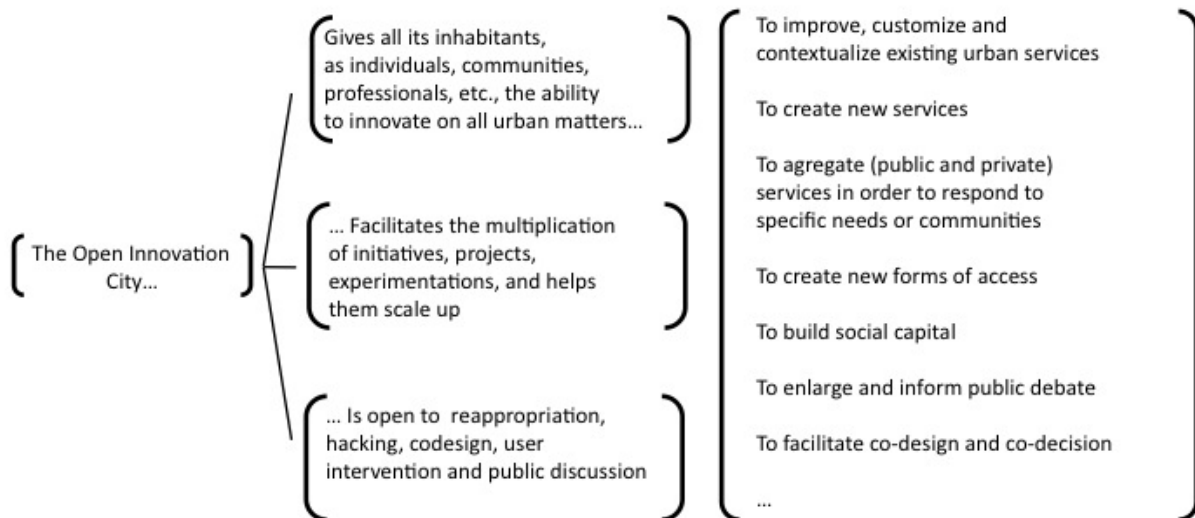
Concluding Assessment

The waste-based innovation scenario has a huge potential to become a stepping stone on the road towards eco-consistent patterns of production and consumption and a full cradle to cradle economy. In particular, it may facilitate learning of the skills, values and competencies required in these new paradigms (emergent materialism). Also, many of the problems created by the current production/consumption paradigms (e.g. landfills) can be softened. However, there is a danger of lock-in into 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 in parallel. Also, several rebound effects may occur if the focus is too exclusively on waste avoidance. The innovation pattern will most likely meet with resistance not least because of negative cultural connotations of waste. At the same time a radical paradigm like this may spur a mood of transition.

3.2 Innovation Future - The Open Innovation City



Open Innovation City Summary



The open innovation city is all about ...

- Co-deciding on all urban issues with citizens and other urban stakeholders. It looks for a win-win partnership between institutions (who can better perform their duties by focussing on their core missions and by receiving constant feedback) and other urban actors (who have an incentive to express themselves, innovate and take initiative).

- Co-producing urban services, not just as classic public-private partnerships, but through constant innovation in services and the delivery of services, stemming from all urban actors, from citizen communities to entrepreneurs, activists and artists
- Facilitating projects of all kinds, from the micro to the macro levels, from experimentation to implementation
- The open innovation city is reflexive:
 - It observes itself, and the actions of its players: It constantly gathers and analyses data; It shares the raw data, the analysis tools and its analyses with all urban actors.
 - It looks for feedback on its actions and all the experimentations that take place within its confines
 - It constantly evolves

Key resources of the open innovation city are:

- Open data, be they public-service information (PSI) or other, crowdsourced or public data
- Flexible places that can support different kinds of activities at different moments
- Co-production places, including Fab Labs to prototype and produce physical as well as digital artefacts

Workshop findings: Opportunities related to Open-Innovation-City

- Ecology
 - Local & connected with the rest of the world
 - Interaction replaces competition, incentive through emulation
 - Creativity tourism across cities will provide a benchmark
 - Successful city-innovations will have a high impact and quickly become mainstream via signalling to other cities
 - Distributed localised patterns of production and consumption
 - production & consumption at the same place
- Education
 - localised practice knowledge (know how)
 - good conditions for informal education and learning from each other
 - more mental health
 - more quality of life
 - higher connectivity
 - being content with all your personal, professional life
- Society
 - Critical mass of stakeholders able to push change
 - shared values: positive energies
 - inclusion
 - identity: real profiles/personalities of cities may emerge
 - quality of life: All aspects and profiles are represented and respected
 - responsibility of citizenship
 - proud to take part
- Employees
 - work locally
 - high motivation
 - rewarding
 - more opportunities to work locally

- people: local expertise / knowledge
- company: local specialisation
- Companies
 - flexible
 - local customisation services
 - lead users at neighbourhood level
- Consumers
 - Benefitting from direct feedback on their inputs as projects are immediately implemented
 - identity transformation: from consumers to inhabitants, local club member, urban dwellers, citoyans
- Cities
 - Potential of systemic innovations due to positive resonance between human and technical systems. These could be linked to ecological systems
 - high local connectivity / social cohesion --> like old villages?
 - elective connectivity --> cooperation between neighbourhoods (less differences between quarters) --> platform role to connect
 - local club-like connectivity
 - emergence of innovators clubs
 - increase of safety
- Politics
 - Change of role, away from “decision maker” towards participation facilitator, animator, moderator, stimulator
 - More problem oriented politics
 - Enhanced inclusion

Workshop findings: Risks related to Open-Innovation-City


- Society
 - Difficult to give visibility to this openness
 - limit of participation
 - lack of management of conflicts
 - Lack of efficiency
 - Overload of ideas
 - Lack of processing and filtering
 - Instable, always changing
 - Mobility of people will hamper participation
 - High transition cost in terms of communication
 - Stick to ideas level - nothing gets implemented
 - high diversity till collapse of collectivity
 - too much effort in participation, less effort in opening minds and transcending local concerns
 - increasing traffic
 - participation fatigue
 - time demanding
 - heavy responsibility
 - lack of information to innovate
 - no common values
 - loss of tradition and identity
 - new forms of segregation

- emergence of participation „elite“
 - differentiation within cities lack of balance between neighbourhood
 - speeding up of segregation of rural and urban areas
- benefits are available only to the “good guys” i.e. people with positive attitudes, no outreach to the public at large
- Cities
 - Lack of difference: All cities become the same
 - Very vulnerable system / easy to hack
 - Local communities stick to their own interest
 - „communitarism“ „localism“ lack of broad views
 - right wing Mafia organisations try to take over cities after cities
 - High influence of pressure groups
 - Lack of democracy
 - Loss of general interest
 - (No) Politics ...
 - Policy maker disappears, becomes one of the stakeholders
 - Stability will be critical
 - Reluctance to leave the decisions really open
 - pseudo involvement --> superficial adjustments
 - hiding power behind a “participatory facade”
 - emergence of tabloid-like participation (masses are stupid!)
 - no regulation between positive / virtuous and negative/vicious circles in participation..
 - (Former) Creative Class
 - creative class decreases
 - lack of strong innovation / breakthrough in new stuffs, no revolutionary ideas
 - Employees
 - users will substitute experts
 - role of experts is changing... shifting to people
 - Companies
 - lack of value creating markets
 - no money
 - no care
 - no social insurance
 - very localised
 - no global market

Open-Innovation-City Concluding Assessment

Society

In the open innovation city social connectivity will be enhanced at city level: quality of life supported by elective connectivity, more social cohesion, enhanced safety due to more social connection at neighbourhood level; Individual citizens will benefit from a feeling of belonging to a community and to a city with strong collective identity; The direct feedback of participation through local implementation and close loops between projects and benefits will be rewarding to all actors. However, there is a risk of communitarism and localism triggered by the strong focus on local communities. It will be difficult to achieve collective resource pooling such as social insurance and pensions funds as well as addressing global aspects. Finally, there are some difficulties in realising the paradigm: Too much emphasis on



participation may result in a participation fatigue. Discrimination may occur between small elites with time and resources available to participate and the rest of the population with less access to governance. High mobility of the population may pose a challenge to the participatory governance;

Business

The paradigm evokes a revival of the old model of local specialisation of production that is based on technological clusters or geophysical opportunities. The Open-innovation-city may cater for a number of new business models such as development of half-finished products provided with local customisation services. However, strong differences between local specificities suggest the lack of global/mass markets and the need of flexibility for companies to adapt to local contexts.

Public sector

There is a danger that time demanding systematic participation processes slow down the dynamic of development of public services. Also constant stakeholder involvement and permanent state of experimentation may induce an ever changing / never working system and a feeling of instability among citizens.

Ecology

The re-localisation of production and consumption activities in the same city will reduce transport; Whilst being rooted in local level, cities may be globally connected through IT networks; The focus on the city level may hide challenges at global level (i.e. ecological challenges; geopolitical tensions, macro economy...).

Education

The focus on the local level may ensure a more practice oriented education. The high social connectivity will foster informal education and learning from each other; At the same time the local city focus may weaken interest in theoretical and general knowledge;

Innovation

In the open innovation city innovation is locally rooted and therefore pertinent to the context; The focus on localisation may reduce contrasted experiences and weaken innovation forces; However, this should be compensated by exchanges and travel across cities; Over-participation may induce too much mediation and lack of breakthrough from radical projects;

Political level

In the open innovation city politicians do not play a specific role in decision making that is mostly deliberated. Policy makers are responsible for enabling and animating an efficient, inclusive and balanced participation process; Policy makers will not easily give way to this change. There is a risk that power structures persist and participation is only superficially realised as a facade.

3.3 Innovation Future - Creative Spirit



Creative Spirit Summary

Key Aspects

- Constant involvement of employees into innovation processes
 - Even the most traditional companies provide conditions, which make it easy for their employees to innovate, ranging from free time for innovation activities to specific creativity tools and high-tech laboratories.
 - Employees are constantly involved in internal process and product innovation projects.
 - For the first time, 70% of all product innovations at a major consumer goods business are based on ideas emerging from a company-wide idea and creativity contest. Almost all companies have annual innovation contests, which focus on ideas for new products or services or have the objective of improving internal processes and working conditions.
 - managers have taken on a fundamentally new role– rather than coordinating workflows, they have become creativity-enhancing facilitators.
- Massive user involvement into innovation
 - as a key feature of corporate innovation policies, customer communities are fully integrated into innovation projects
 - through extensive reforms of copyright and intellectual property rights, creative commons has become the standard for the protection for original works and authorship.
- Innovation camps widely established
 - People regularly join “Innovation camps”:
 - Spaces for experimental, collaborative problem solving, participatory decision making and joint learning, set up by private and public actors for a limited time span.
- Children as top innovators
 - education primarily focuses on developing creativity skills and innovative mindsets

- Increasingly, children are integrated into research and innovation projects
- *notion of innovation changing towards everyday creativity and identity formation*
 - “Innovation today is more akin to the acquisition of “wisdom”, it is the process of personal identity creation, the learning that gradually defines the social creature called a human.
 - innovation is primarily heterarchical and happens through what might be called “refinement of taste”: the learning that occurs during a person’s voyage through life”¹³

Workshop findings: Creative Spirit opportunities and risks

	positive creativity as a „collective / community enterprise“	negative creativity / innovation as an individual competitive enterprise
Politics	Empowerment of citizens, employees and customers is fostering democracy more human policies appreciation of everyone’s contribution Everyone can influence the living environment	Legislation lags behind innovation speed Political space reduced – techno-optimism. Lack of regulation and standardization hampering innovation Can’t catch up: Loss of knowledge through too many ideas
Innovation	strong appreciation of ideas and innovation particular encouragement of radical innovations as people are ready to take bolder risks shift of value creation into early phase of innovation process (idea generation). Emergence of new idea markets Widespread innovation: a new process that needs to be facilitated: --> collection of ideas --> mixing of people / innovators --> brokering (e.g. help children innovate) --> stimulating (e.g. disrupting routines at work) --> very effective in creating innovations More creativity, more ideas	Lack of recognition for new ideas since they lose value due to their sheer mass. Innovation as fashion no radical innovations since risks will likely be taken on a collective level, and a smaller willingness for risk-taking is to be expected. only the most populist ideas become implemented.
Society	New processes, better education, better	Discrimination of people who do not adopt newest technology

¹³ Riel Miller Xperidox INFU working paper

	<p>governance structures</p> <p>internet will enable many more people to give feedback to companies on their products</p> <p>„translational machines“ will provide link innovation camps worldwide</p> <p>recursive ‚innovation‘ society: is self-stimulating, sustainable and inclusive („diversity programs“)</p> <p>constructive criticism and tolerance are fostered and valued</p> <p>open self-production platforms support instant usage of the products</p> <p>be innovative: think --> but not too much questioning hierarchies</p> <p>open communities and innovation contests provide rewards for creativity</p>	<p>Wisdom replaced by gadget solutions!</p> <p>Technological (Cancer) Society</p> <p>Innovation Hamster Wheel</p> <p>Only most populist ideas become implemented</p> <p>Innovation process as race without progress destroying its own foundation.</p> <p>In the end, hyper-innovation produces disappointment and uncritical rejection.</p>
Ecology	<p>Relevance evaluation by „the crowd“: community makes sure that ecologically sound and sustainable innovations survive</p> <p>more relevance through openness + networking among innovation promoters and opinion leaders</p> <p>more local relevance</p>	<p>Shorter product life-cycles, less ecologically sound products and more waste, products become less reliable and safe</p>
Economy	<p>larger pool of ideas</p> <p>better management of ideas</p> <p>less risk in innovation process, better products</p> <p>Speedy processes important for companies, faster decision making</p> <p>„wisdom of crowds“ lowers entry barriers for people to join innovation teams</p> <p>3-D-Printing accelerates manufacturing of new products and enables access for everyone</p> <p>open and collaborative corporate culture</p>	<p>very high competition: only paranoid brands survive</p> <p>too much creativity hinders the implementation of ideas = innovation balance between change and continuity is lacking</p> <p>lacking reliability & safety of investment goods (permanent re-investments required)</p> <p>lack of stable business contacts (due to project based work forms)</p>
Employees	<p>creativity unites business and private life</p>	<p>Strong competition and burn-outs among employees and self-employed</p>

	--> higher job satisfaction, from profession to vocation (calling) from value creation to value appreciation	Very high competition between individuals and companies Ideas are little appreciated: emergence of creative poor no reflection over own output
Consumer	better products through faster attainment of idea iterations user based innovation more products + / -	Less reliable & safe products No upward compatibility No long-term testing Difficulty of getting used to ever new systems in particular for elderly Technology dependency Excessive virtualization
Education	new educational system positive employment effect positive training effect (+ leave room for intuition)	
Media	more content more interesting more relevant	Media instrumentalized as promoter of R&D Loss of its critical role --> hype for R&D Data Waste
Research		Depreciation of expertise More bullshit published Data waste Lowering of critical standard of scientific publication - strange ideas get developed like cancer --> e.g. creationism

Concluding Assessment

The creative spirit scenario may turn out in two different ways: As a collective community enterprise with a number of positive implications or else as a more individual and competitive paradigm which is largely seen as a problematic development. Both “sides of the coin” are characterised by a high speed of innovation activities. The collective enterprise however leads to a greater appreciation of ideas and adequate governance of outcomes whereas the individualised scenario entails an “innovation race” with negative consequences for products, environment, working conditions and ultimately quality of life.

3.4 Innovation Future - Automatised Innovation



Automatised Innovation Summary

The vision is characterised by three key aspects

Virtual only: Many innovations are enjoyed only virtually. Human appetite for newness is satisfied more by virtual means than by “real” products.

Web extracted information:

- scanning the internet for ideas, and picking those that answer the current customer needs is a common innovation mode
- Semantic web-filters track changes in consumer preferences in real time

„Darwin’s innovation“: Digital systems randomly create and test innovation variants before selecting the fittest. Enormous amounts of variants are tested by simulating the end-user.

Automatised innovation is complementing and supporting but also partly replacing creative processes among humans.

Workshop findings: Automatised Innovation Opportunities

- Society
 - Handling of complexity is supported as systemic linkages are represented (systems of systems): Steering of “spaceship earth” becomes easier, hierarchic systems can be overcome
 - Reorganisation of innovation system: New linkages within R&D and between R&D and society
 - SELF-ORGANIZED MAPS allow for mapping unknown territories (e.g. cognitive distances, routines)
- Politics
 - political transparency through better monitoring
 - problem solving algorithms available
 - better decision making
 - more accurate political agenda thanks to web extracted information
 - new tool: simulation / testing of politics
 - shift from project to infrastructure funding

- Open Data / Open algorithms
 - enabling process
 - new businesses
 - Social Integration
 - power Shifts
 - opinion Leaders lose some of their power

- R&D landscape
 - Internationalisation and standardisation of R&D

- Consumer
 - Better expression of needs including non-explicit ones
 - Satisfaction of individual needs through personalized services and products
 - identification of new customer demands
 - particularly relevant for consumer goods because of statistic relevance in the web + emotional involvement

- Companies
 - increased efficiency = less resources required to produce new products & services
 - faster innovation: different fields merged can make for a breakthrough
 - increased effectiveness = less flops
 - ability to test business models
 - new companies
 - less effort necessary in early phase of innovation (low threshold) --> shifts of relevance of individual steps in innovation chain
 - overcoming barriers of profit-oriented product innovation / development
 - transfer, copying of algorithms is possible, no patenting of algorithms, overcoming traditional company „power“

- Ecology
 - Less prototypes
 - less waste
 - allows testing of ecological footprints in advance
 - allows comparison & selection considering ecological factors
 - Analogical reasoning / measurement

- Employees
 - less pressure to be creative, more time for quality and creativity
 - more possibilities for different groups to participate in the innovation process because of more support & training
 - IT workforce as winners, key element in change and maintenance of algorithms
 - Designers as mediators between consumers and industry
 - evaluation of input
 - filling of the creative gap for IT workforce, the ‚what if?‘-moments
 - system specialists are needed to further develop simulations (biologists, designers, political analysts etc.)

Workshop findings: Automatised Innovation risks

- Society
 - It's just a tool and not the rule
 - Challenge: Data security, data reliability!
 - shallow innovation: no radical innovations, no big solution
 - path dependent, can't think the unthinkable, no out of the blue innovation, based on today's data, innovation is always only a recombination of existing elements (see waste based innovation)
 - only a supplementing innovation pattern, no substitution
 - faster innovation cycle
 - negative perception of innovation, innovation fatigue because it comes from a machine
 - no implicit (tacit) knowledge --> only what is written down can be captured
 - some people (who understand a little bit more of the complexity) can rule, control the others, without the others being aware of it
 - Web-Access of people is determining innovation process
 - Non representative „Samples“ are misinterpreted
 - Interfaces are simple therefore the underlying complexity is not recognised
 - Emergence of Criminal actors
 - expanding control & spying, threats to privacy
 - „virtual system / society“ can be manipulated, false preferences can be generated, avatars can be used to influence the innovation process, artificial snob-effects are created on purpose
 - no ethical issues are considered, no points of control
 - DIGITAL DIVIDE
- Precondition
 - unlimited access to data
 - incredibly fast calculation capability
- Company
 - finding unique selling point is difficult
 - business models do not work
 - Algorithms out of control! (google does not know their own algorithm)
 - How to integrate ethical issues into an algorithm? Dependent on the algorithm
 - Does not work because learning in real life can not be substituted
 - Innovation machinery
 - less reflection
 - no mission
 - garbage in, garbage out
- (No) employees
 - only IT-experts earn a lot --> no true innovation
- Ecology
 - -„8 million customized unicorns“
 - A system directly connected to production can lead to cancerous growth
 - Production system is limiting the products possible
 - frustration because realisation is limited
 - preference for easy solutions, lack of radical approaches

- Politics
 - psychological influence via suggestion of artificial societal needs / preferences
 - authority challenged --> free lunches are registered
 - no awareness for risks connected to data privacy
 - policy excluded from relevant innovation process
- Consumer
 - Creation of artificial markets, misuse --> leads to wrong data
 - artificial intelligence needs to be controlled when values are involved and when tightly coupled to systems with significant impacts
 - data base on consumer behaviour is necessary and can be abused
 - fashion drives consumption, no more systematically created fashions could lead to less consumption
 - no fashions, everything is equal because everything is possible
 - privacy concerns lead to information hiding and closure
 - only pre-filtered, tailored information available: consumers are locked in a bubble and become bubble dependent
 - the majority does not always select the most favourable innovations
 - Opinion mining can lead to opinion influencing

Automatised Innovation Concluding Assessment

Strongly polarising subject

On the one hand people ..

....really believe in it

....they are convinced that this is already on the way, that we have not really noticed how far we have already gone in the process

On the other hand...

... really do not believe in these developments

...are rejecting it and see mainly the risk of it

It seems that the assessment of this model differs in particular between generations.

Lack of awareness and knowledge

There is a great deal of uncertainty about what is going on right now: we don't really know how the algorithms are developing now and whether they can already achieve what is implied by the scenario. We don't really know about the data that is already gathered and available. This is probably also the reason why the subject is so strongly polarising.

Evolving algorithms on the rise

Evolving algorithms are already widespread in the internet. The google search algorithm is one of those evolving algorithms that are actually not controlled by humans anymore. Nobody knows how it evolves and it has already become so complex that nobody can see the thing as a whole. When you log-on to the internet, there are 57 factors that are transferred to google to personalise your search such as: where you are, what computer you use, what browser you use, what plug-ins you have installed in your browser. That means that automatised innovation is already happening! Also engineering and design deploy evolving algorithms for example to optimise cars' cw-values.

**Conclusion: High risk and high reward**

People are scared by automatised innovation because of the lack of knowledge and control. On the other hand we couldn't handle all this complexity in innovation without these algorithms. There is a high risk of abuse of data and the algorithms „getting out of control“. The potential reward is in the speeding up of the innovation cycles, the tremendous increase in effectiveness and the environmental benefits through simulation of system effects.

4. Crosscutting Conclusions

4.1 Implications for ecosystems

All three innovation futures hold both negative and positive implications for ecosystems.

Automatised innovation promises new ways of testing and measuring ecological impacts and even testing or simulating policies with respect to their environmental effects. As a side effect firms may be hiding information which would restrict evaluation of ecological impacts. Automated innovation may bring about a kind of cancer economy with unlimited generation of ever new products. At the same time radical systemic innovations as they are required to reorient societies may be hampered by the paradigm.

The **city-driven innovation** scenario is the one most striking implications for ecosystems. It provides an enormous potential to achieve the critical masses that are needed to implement big solutions. There might be a signalling effect from pioneer cities to many other contexts. There is also high potential for systemic change in the city context as the local niche level may function as a test-bed for systemic solutions. A negative side in the city driven innovation is a lack of broad and global views. There may be too much focussing on the city scale but insufficient consideration of what happens in other cities and the environment globally. Another negative aspect is the increased transaction costs due to participatory processes in preparing any solution.


Finally, the **creative spirit** does not necessarily provide any connection to ecology it is no priority lane for ecological solutions. But on the other hand, there might be more ecologically beneficial inventions if more ideas are generated. Even radical solutions may be identified from the rich diversity of ideas provided. On the negative side it speeds up and shortens product lifecycles, so a more material intensive world is created and unnecessary products are invented; there is a risk of inefficient implementation of solutions and other cancer-like phenomena.

4.2 Implications for companies

In each scenario there are positive and negative implications for companies.

In **automatised innovation** it is difficult for traditional firms to apply traditional business models. Companies will struggle to generate new business models and unique selling points. On the positive side, the innovation process becomes quicker, faster and more efficient and effective.

For **waste-based innovation** on the positive side there are multiple new ways for companies to earn money and to create new business out of this innovation model. In this landscape „low-tech“ can be a cash-cow or a business model. There is a potential for substantial cost reductions due to reduction or even elimination of waste. On the negative side it is not possible to achieve economies of scale. There is a risk that a shadow-economy or even a “Waste mafia” will emerge with strongly negative consequences for the market and companies. The emerging recycling industry may undermine social standards and adequate working conditions. Finally, the waste based paradigm is conflicting with the growth



paradigm that is currently dominating global economies. If the concept is not implemented on a global level, the respective countries' and companies' competitiveness will suffer.

In **widespread creativity** there are several positive aspects for companies: Creation of an idea-pool, speeding up of the process and probably also risk reduction, due to better ideas from the crowds or from the creative employees.

On the other hand companies, like society probably need some kind of stability and continuity, so if a company is permanently changing it runs the risk that it cannot establish an identity. Also, a number of individuals may be competing in the crowdsourcing activities with under high pressure and low quality working conditions.

The **open innovation city** may well offer companies innovation and new markets on the city level in particular through locally customised products. On the other hand the focus on the local level may restrict companies' activities to small and local niche markets whereas the access to global markets and the launching of global products become much more difficult.

Summary: Every innovation vision offers an opportunity for some industries and companies and poses challenges to others. Often the impact will depend on the transition speed.

5. Presentations of Innovation Futures

innovation-futures.org
A Foresight Exercise on Emerging Patterns of Innovation
Visions, Scenarios and Implications for Policy and Practice



Innovation Future - Creative Spirit



Creative Spirit – Key Features



- All employees „from janitor to top management“ constantly involved into innovation processes
- Majority of product innovations based on user input
- Innovation-Camps for problem solving widely established
- Children as top innovators
- *notion of innovation changing towards everyday creativity and identity formation*

Constant involvement of employees



- Even the most traditional companies provide conditions, which make it easy for their employees to innovate, ranging from free time for innovation activities to specific creativity tools and high-tech laboratories.
- Employees are constantly involved in internal process and product innovation projects.
- For the first time, 70% of all product innovations at a major consumer goods business are based on ideas emerging from a company-wide idea and creativity contest. Almost all companies have annual innovation contests, which focus on ideas for new products or services or have the objective of improving internal processes and working conditions.
- managers have taken on a fundamentally new role– rather than coordinating workflows, they have become creativity-enhancing facilitators.

Massive User Involvement



as a key feature of corporate innovation policies, customer communities are fully integrated into innovation projects

through extensive reforms of copyright and intellectual property rights, creative commons has become the standard for the protection for original works and authorship.

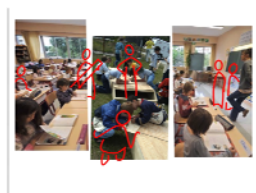
Innovation Camps Widely Established



People regularly join "Innovation camps":

Spaces for experimental, collaborative problem solving, participatory decision making and joint learning, set up by private and public actors for a limited time span.

Children top-innovators



education primarily focuses on developing creativity skills and innovative mindsets

Increasingly, children are integrated into research and innovation projects

Gradual shift of meaning of innovation



"Innovation today is more akin to the acquisition of "wisdom", it is the process of personal identity creation, the learning that gradually defines the social creature called a human.

innovation is primarily heterarchical and happens through what might be called "refinement of taste": the learning that occurs during a person's voyage through life"

Riel Miller: INFU working paper 2010

innovation-futures.org

A Foresight Exercise on Emerging Patterns of Innovation
Visions, Scenarios and implications for Policy and Practice



Innovation Future Waste-Based Innovation



Waste-Based Innovation* – Three core systems

- The On Demand Economy - Waste is significantly reduced through producing only in accordance with demand.
- The Surplus Ecosystem - A parallel social system that treats waste (Surplus) as material resource and exchanges it's own Surplus (new/upcycled products) with society.
- The Access Culture - An autonomous distributed network, working to provide everyone with access to knowledge, tools and resources they need to improve their lives and environment.

*Jay Cousins, Christopher Döring INFU working paper 2010

Waste-Based Innovation – Infrastructures

Waste Mines provide access to waste resources

Material labs In Material Labs, Material Experts combine and separate organic and synthetic materials to create products which can be more easily disassembled through composting. Material Labs store and extract resources from waste - continuously experimenting with new methods of extraction and disassembly.

Material Labs often can be found close to Fab Labs in relevant scales, providing complimentary services.

Scalable Fab Lab Network

Fab Labs where people are enabled to produce their own products operate at both hyperlocal, community, and global scales. Local Labs, Factories, and Home Labs all provide different levels of commercial and social engagement.

Waste-Based Innovation – People

Surplus Sufficient

The Surplus Sufficient views waste as surplus - just a resource that there is too much of that needs reallocation and re-evaluation.

Surplus Sufficient constantly mediate between waste providers and users. They are highly valued by industries and businesses looking to improve their own resource management, as their knowledge base, networks and behaviors make them well equipped to identify new opportunities.

Surplus-Sufficient-Specialists

Hunter-Gatherers: food
Space Invaders: spaces

Waste-Based Innovation – Enabling Technologies

Waste Tracking

RFID chips in all products providing the Access Culture with the ability to augment products and the Surplus Ecosystem with the opportunity to locate material and resource clusters.

Permatape

Permatape is a fabric tape which hardens when in contact with the air. When wrapped around any two objects it binds them tight together and can create a multitude of structures with ease. Permatape can be treated with an organic solvent that temporarily returns it to its fabric state.

Modular Products

Highly specialised yet interfacing products which can be combined "lego style" to meet specific functional needs.

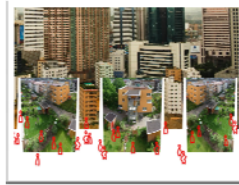
Module/Component exchanges

Both localised and virtual spaces. Local exchanges can be found at the material labs, virtual spaces allow for "home composting" and object swapping.

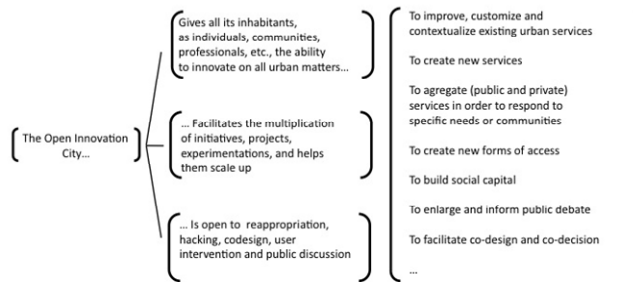
Augmented Products

Products are augmented by RF chips and other technologies allowing for contained materials to be identified, processes and production flows to be comprehended, as well as instant access to a wiki showing every potential use of a product in its afterlife.

Innovation Future - The Open Innovation City



The Open Innovation City



The Open Innovation City is about

- Co-deciding on all urban issues with citizens and other urban stakeholders. It looks for a win-win partnership between institutions (who can better perform their duties by focussing on their core missions and by receiving constant feedback) and other urban actors (who have an incentive to express themselves, innovate and take initiative).
- Co-producing urban services, not just as classic public-private partnerships, but through constant innovation in services and the delivery of services, stemming from all urban actors, from citizen communities to entrepreneurs, activists and artists
- Facilitating projects of all kinds, from the micro to the macro levels, from experimentation to implementation

Open Innovation City is reflective

- It observes itself, and the actions of its players: It constantly gathers and analyses data; It shares the raw data, the analysis tools and its analyses with all urban actors.
- It looks for feedback on its actions and all the experimentations that take place within its confines
- It constantly evolves

The Open Innovation City – rests upon key resources

- Open data, be they public-service information (PSI) or other, crowdsourced or public data
- Flexible places that can support different kinds of activities at different moments
- Co-production places, including Fab Labs to prototype and produce physical as well as digital artefacts

innovation-futures.org

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



Innovation Future – Automatised Innovation



Basic Ideas (from 3 Visions)



Virtual only: Many innovations to be enjoyed only virtually. Satisfy human appetite for newness



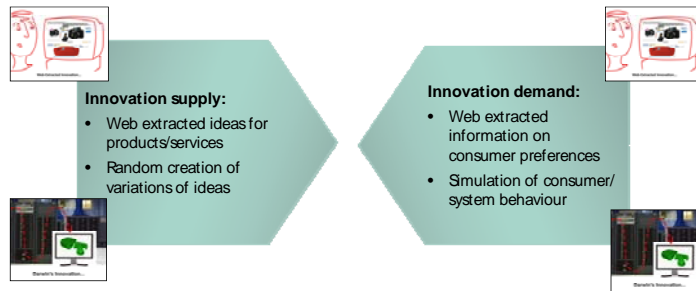
Web extracted information:

- Scan the internet **for ideas**, and pick those that answer the current customer needs.
- Semantic web-filters track **changes in consumer preferences** in real time.

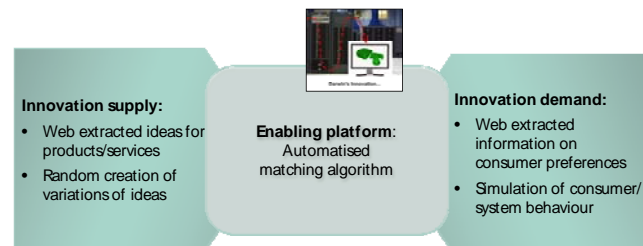


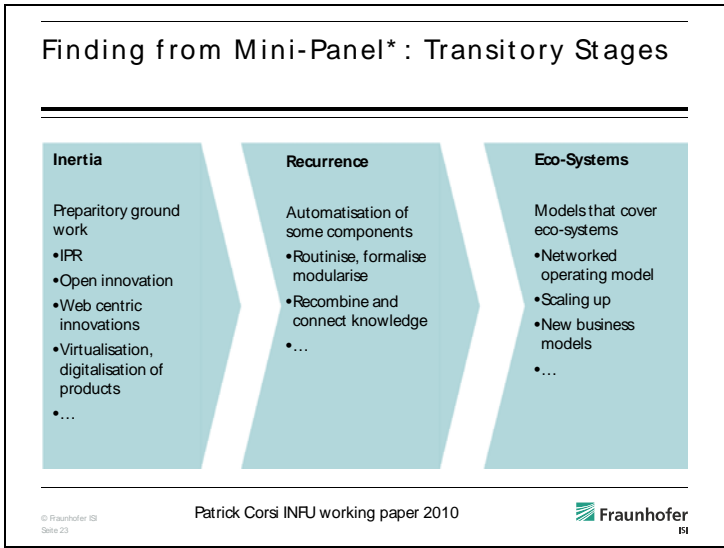
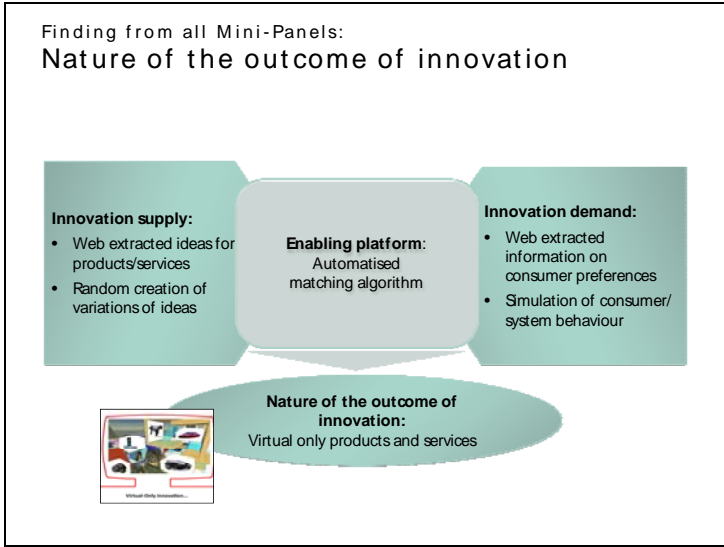
„Darwin“: Digital systems **randomly create and test** innovation variants before selecting the fittest. Enormous amounts of variants are tested by simulating the end-user.

Finding from all Mini-Panels: Mechanisms mediating demand and supply



Finding from all Mini-Panels: Innovation support infrastructure





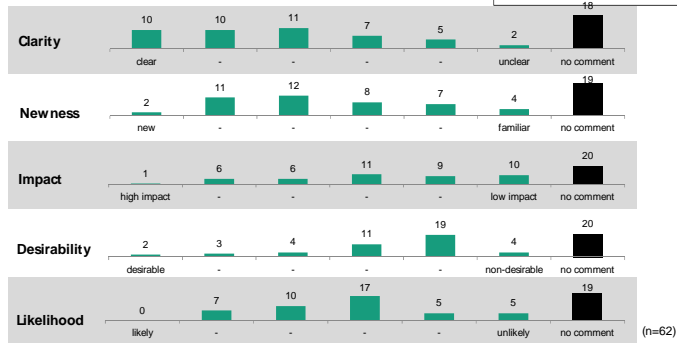
Integration in Scenarios

- *The fallen Giant. European Innovation Fatigue:*
 Automatised Innovation is substituting creative processes
- *Unleashing the Creative Spirit. Europe's Innovative Societies:*
 Automatised Innovation is complementing, supporting, accelerating creative processes

Spotlight 2025
 Automatised Innovation by Auto-Inno 3.0
 Advertisement

Auto-Inno 3.0 is base on the most advanced insights of brain research, simulating cognitive processes... It identifies bright ideas even within hidden domains of the Web, it extracts inspirations from everywhere in the virtual world, but with it's TRIZ-based ideation-generator it also combines and transforms finding into novel concepts, novel products, novel services, and novel business models. ... It helps you to adapt innovations to your customer base, depending on your preferences...

Vision 2: Virtual-Only innovation... (I)



Vision 2: Virtual-Only innovation... (II)



- "...a new notion of gaming will emerge and the boundary between gaming and real life will blur."
- "...For services, it can be great (avatars online, experts online...) and this knows "virtually" no limits. Very long-term wise (2040) I think this is the way society will work..."
- "The possibility to present innovations virtually should rather have the purpose to collect viewers' reactions, ideas and improvement suggestions that can be finally turned into real products."
- "...interesting to see that the World Bank is currently tendering a survey on the development potential of the virtual economy"
- "...there is a danger here of people losing touch with real-life objects and communication."
- "...it might be feasible in the future... but far distant... not in the nearest future..."
- "it will become a mix between real experiences (mood, emotion) and virtual enrichments..."
- "Technically implausible, but practicable; additive understandable, but not substitutive"
- "...open source networking will not reflect professional markets, but they will evolve in platforms of professionals"
- "...this vision also opens an ethical question: how/who decides a priori that an innovation is less useful and should be kept virtual?"
- "People will not be satisfied with virtual-only innovation: they should fill it in the real world..."
- "it's already the case of 'concept-products' with a virtual existence to be discussed and assessed..."
- "... but the data integration gets more and more difficult."
- "...many opportunities for the development of new products. ...I think this will an important topic in the future..."
- "...The virtual room could serve as stepping stone for some ideas, for instance if you later combine them with a 3d printer. Definitely important for the gaming industry"
- "...I feel I would like to go beyond the virtual and be able to see, touch and smell it (thought of course some of these desires will be able to be satisfied virtually too); if it all goes virtual, how far are we away from what is shown in the film 'the matrix'?"



INFU Scenario Assessment

23rd of May 2011

Karlsruhe University of Arts and Design
Lorenzstraße 15, 76135 Karlsruhe, Germany

Workshop Agenda

8.30 Arrival, Coffee

9.00 – 10.30 Introductory Session

Philine Warnke & Elna Schirrmeister Fraunhofer ISI

- Welcome, Purpose and Outline of the Day
- Introductory round
- Introduction of the INFU scenario elements
- Introduction of World Cafe Framework

10.30 - 12.00 World-Cafe Scenario Assessment I - Appreciation

Elaborating positive implications of the INFU scenario elements
Four Cafe-tables hosted by the INFU team

12.00 – 13.00 Lunch

13.00 – 14.30 World-Cafe Scenario Assessment II - Criticism

Elaborating negative implications of the INFU scenario elements
Four Cafe-tables hosted by the INFU team

14.30 -15.00 Coffee and group review meeting

15.00 – 16.30 Harvesting

- Presentation of scenario assessments by table hosts
- Presentations of implications by group rapporteurs
- Multi-criteria voting exercise

16.30-17.00 Wrap Up & Feedback Round

17.00 End of Workshop

Optional: World Cafe Tablecloth exhibition, Dinner

