Summary of the INNO-Grips Workshop

Disruptive Innovation – Implications for Competitiveness and Policy

24th January 2012, 09:30 – 16:45 hrs

Brussels, Hotel Crowne Plaza Brussels "Le Palace"

1 Context and objectives

An innovation is "disruptive" if it has a significant impact on a market and on the economic activity of firms in that market. The focuses is thus on the impact of an innovations as opposed to its novelty (OECD Oslo Manual, 2005). The term is widely used today in the sense introduced originally as disruptive technology by Christensen's seminal work "The Innovator's Dilemma" (1997) which triggered an intensive debate about the concept. However, the debate has, so far, predominantly focused on implications for *business strategy* – it has hardly ever been discussed from an innovation *policy perspective*.

This INNO-Grips workshop discussed the concept of disruptive innovation with a view to possible implications for the competitiveness of the European industry and for innovation policy design. The workshop focused on the following sectors:

- the chemical industry
- the automotive industry
- tourism
- transport and logistics

The workshop was linked with an INNO-Grips policy brief on the same topic. The brief offers an introduction to the theory of disruptive innovation, identifies disruptive trends in each of the sectors analysed (in terms of their implications for competitiveness) and proposes strategic responses for innovation policy. The key question was to assess whether disruptive innovation presents a specific case for innovation policy which requires specific responses.

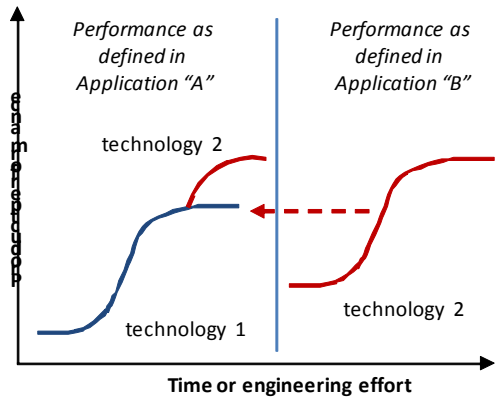
The study team presented the results of this draft policy brief. The main objective of the workshop was to validate this assessment through discussion with innovation experts. The workshop was attended by 26 experts (see list in Section 3), including representatives from the European Commission, national ministries and governmental agencies, innovation researchers and consultants.

2 Presentations and main discussion points

2.1 Introductory session: 'Disruptive' vs. 'incremental' innovation

The first session introduced the concept of disruptive innovation and its main theoretical foundations. It focused on the seminal work of Clayton M. Christensen on disruptive innovation and the subsequent debate of this framework.

Presentations



Hannes Selhofer, INNO-Grips project manager and empirica, and the coordinator of this policy brief, gave an introduction to the disruptive technology framework as developed by Clayton M. Christensen. He explained that the framework refers to the widely used S-curve of a technology life-cycle and the concept of value networks. While in a conventional framework of intersecting S-curves, the vertical axis typically depicts a single performance measure, that a truly disruptive technology cannot be plotted in this framework, because the new technology competes on other criteria than those that were typically used to measure performance.

Often, the innovative technology initially is more simple and offered at a lower price than existing products, appealing to low-end, price-sensitive customer segments (right S-curve). After some time, however, when the technology has matured, it may surpass the incumbent technology even with regard to the traditional performance criteria that used to rule the market and will then gradually replace it. Incumbents often have difficulties in coping with disruptive technology and face the risk of being driven out of the market by new entrants. Christensen's work on the impacts of disruptive technology and how companies should deal with triggered an intense discussion and critique of the concept in academic and business literature. The speaker raised some of the issues discussed, such as the lack of precise definitions, the need to differentiate between high-end and low-end disruption, the question whether the disruptive technology framework is suitable for making ex ante predictions (predictability), the issue of co-existence vs. replacement of the conventional technology or business model.

Thor Haugness, innovation consultant at Infosector, Norway, elaborated on this concept by discussing a practical example of disruptive innovation in Christensen's terms: the Wii remote controller by Nintendo, a motion-sensing wireless controller allowing players to control the game using physical gestures instead of buttons. Wii is the main competitor of Sony's Playstation and Microsoft's Xbox. It has become the best selling home game console on the global market, although it underperforms in all conventional performance criteria compared to its competitors (graphics, speed, realism, number of games available on console). The speaker argued that Wii outperforms the competitors in a new aspect, however: it is more intuitive and can be better used in social settings (e.g. in groups). Thus, it opened up a new market –'casual gamers', a much wider demographic group of previous non-gamers. However, as the speaker outlined, it is not a case of disruptive technology replacing the conventional technology, but a case of co-existence: there are markets for both games played with motion-sensing wireless controllers and for games with the conventional button-based controllers.

In the second part of his presentation, Mr Haugness established a first link to innovation policy. He argued that there were two key challenges for innovation policy stemming from disruptive technology:

- the issue of taking risk: basing innovation policy on assumptions about potential disruptive developments;
- coping with diversity: taking into account the various types of disruptive innovation when designing innovation policy (e.g. business model innovation vs. technological innovation)

He raised the question whether RTD funding programmes may possibly be designed in ways that could discriminate against innovation projects with disruptive characteristics. As disruptive trends are not necessarily high-tech innovations (e.g. in the case of Wii), the emphasis on technological R&D may not always be adequate to drive and promote important innovation trends. The conventional criteria used to evaluate innovation projects may thus be biased towards sustaining innovation projects.

Discussion

The presentations were followed by a lively discussion, which focused very much on the implications for the design of innovation policy. It was controversially discussed whether innovation policy should in any way aim to discriminate between sustaining and disruptive innovations. While some speakers questioned the possibility to reasonably do so (because the lack of predictability), others argued it was important to take this risk, since ignoring potentially disruptive trends equally involved a risk (of missing out on opportunities, being late in the development).

Specific contributions included the following points:

- Several speakers argued that innovation policy should aim to think in “unconventional combinations”, as important (disruptive) innovations are often the result of using technology in new ways rather than creating new technology. “Innovation is rarely invention-based”, as one speaker put it. The incentives provided through R&D funding schemes and research in universities, however, are often biased towards encouraging inventions.
- In the same line of thinking, a speaker warned against narrowing down the discussion on R&D policy in this context, as innovation policy was much broader and has other instruments – which could, in fact, be more relevant to exploit disruptive innovation in the best possible way.
- It was also suggested that user-driven innovation and systemic innovation (e.g. driven by and enabled by social networks of users) should be given more attention. Europe would need more “small / simple innovations” with low entry barriers.
- A speaker tried to make a link between R&D efforts of the private sector and public funding. He stressed that enterprises regard R&D activities from a risk perspective – the willingness to invest in disruptive technology development depends on the typical profit margin of the sector and the degree on uncertainty for backing a new technology. The higher the risk, the more there will be a need for co-financing from the public sector to share the risk.

2.2 Disruptive innovation in the automotive industry

The second session focused on innovative trends in the automotive industry and their disruptive potential. The speakers presented the preliminary results of the INNO-Grips policy brief and a specific case study about a US start-up company with a new business model.

Presentations

René Arnold, researcher at the Institut der deutschen Wirtschaft Consult, Cologne, and member of the INNO-Grips study team, presented an assessment of major innovations in the automotive industry. He argued that the main innovation trends in this industry were determined and driven by global megatrends, in particular the shortage of raw materials (notably, but not only, oil) and climate change. He saw fuel economy as the most pressing challenge for car-makers, independently of the segment and size of the car. Changes in demand patterns could affect, in the longer term, existing concepts of mobility, with potentially disruptive impacts on a technological but also on a supply-chain level.

The development of electric vehicles (including "HEVs" and "BEVs" - hybrid and battery electric vehicles) can be seen as the industry's response to these changes. China plays a key role here, as it heavily subsidises the purchase of electric cars and is the first-mover in this development. However, he pointed out that it was still controversial whether and to what extent these shifts would actually have a disruptive impact on the industry. While, from a technological perspective, at least BEVs are clearly a disruptive innovation, from a consumer's point of view, it is not necessarily disruptive as long as the objective is to develop these cars to the same specifications in terms of range and speed as conventional cars. He concluded that there are two possible scenarios with different implications for policy and the industry.

- In a conservative scenario, there will be no major mobility paradigm shift; BEVs will remain a niche market product for the foreseeable future and thus have only a limited disruptive impact.
- In a dynamic scenario, the mobility paradigm shift from ownership towards „mobility as a Service (MaaS)". Here, BEVs play a more important role, as they are in many ways well-suited for car clubs / car sharing schemes. They could enter the mass-market that way and lead to significant disruptive impact in the automotive industry.

Allan Martel, innovation consultant in Ottawa, Canada, presented a case study on Local Motors (http://www.local-motors.com), a US-based company that has a new concept for manufacturing cars. Basically, the company enables customers to design their own car (in a community-based approach), selecting from off-the-shelf components, using an open-source CAD software tool. Mr Martel said that Local Motors was "the first disruptive entrant in the US automotive industry in decades", even if it is a small company and likely to remain, a niche market operation.

A key challenges to realise this concept is that not everyone who wants to participate has access to professional level CAD software. It finally managed to agree on a cooperation with Siemens PLM. Siemens has developed two new products for this purpose and is making them available exclusively through Local Motors – users do not have to purchase the software, but can use it for a fee of USD 19.95 per month. Mr Martel believes that this aspect (making available CAD functionality on a low-cost basis to specific communities) could have a disruptive impact on the CAD software industry, since it is completely different to the conventional model of selling software.

In the automotive industry, the concept introduced by Local Motors, if successful, could have an impact on auto-making (low inventory, high cash conversion, low capital intensity assembly facilities), auto-selling and auto-servicing, according to Mr Martel.

Discussion

The presentations triggered a discussion whether the societal concept of mobility was actually about to change or not. This mirrored the high degree of uncertainty in the industry about the developments ahead. A participant who advises suppliers to the automotive industry in their innovation strategy said that the whole sector was currently "totally unsure to what extent they should make investments in making the shift to electric and hybrid vehicles". Another discussant critically pointed out the global societal challenges may actually not yet be a strong driver, as fuel-consuming SUVs are still highly popular and car ownership and congestion in cities was still increasing. It was also suggested that the development of electric cars could be another example of co-existence of technologies, as depicted in the first (conservative) scenario presented by Mr Arnold – electric vehicles being used for some purposes, conventional cars for others.

A participant stressed that China leveraged economies of scale in advancing BEV, and that this was a good example for Christensen's disruptive technology framework: the disruptive technology is currently used not in the mass market (as it still underperforms in conventional criteria such as reach), but as a niche product. Mr Arnold explained in response that China had a huge interest in advancing electric cars, as it would mean shifting dependency from oil to rare earths (where China is a major source) which are needed to produce batteries.

As for policy responses, a representative of DG Enterprise and Industry suggested that the primary role of policy was to set priorities, and then to allocate resources accordingly. He said the big challenge was how to deal with risk, similarly as for companies. He argued that the public sector cannot be expected to take substantially more risk in betting on specific developments than private sector companies.

Another speaker stressed the long time it normally takes from an invention or a disruptive technology to its broad commercial use – typically 20-30 years. The challenge for policy was to act with a foresight perspective, i.e. to anticipate such shifts in due time.

The discussion also focused on the differences between private goods and public goods. The objective of fostering electric cars could be desirable from a societal perspective (public good) but not in the same way from the industry's perspective (private good). A speaker argued that innovation policy, in contrast to what it claims to aim at, almost always had a strong bias towards the private goods perspective, in particular through the mechanism of funding private R&D activity ("private goods always win"). If policy was serious about the public good dimension, he said, it would need different instruments such as adapting the regulatory framework.

Finally, there was a discussion of the SME dimension – to what extent the anticipated developments would specifically affect SMEs. In this context, a representative from Eastern Europe said that the dominant R&D funding mechanisms would not adequately support individual innovators, while their creativity was often a major source of innovation (rather than corporate innovation structures).

2.3 Disruptive innovation in the chemical industry

The fist session after the lunch break discussed innovative trends in the chemical industry, such as innovation in materials, production processes and workflows, and the strategic implications for the industry and innovation policy.

Presentations

Hannes Selhofer from empirica presented the assessment of the policy brief. He stressed the role of the chemical industry as a catalyst for innovation in other sectors, and that the problem-solving know how from the chemical industry is needed to address global challenges such as climate change or energy and raw materials efficiency. He explained the different pathways of the 'Innovation transfer' to or from the chemical to other industries. This can be by enabling improved product characteristics (such as reduced weight, longer durability) through new materials developed and supplied by the chemical industry; as an enabler of process innovations in other sectors; by lowering procurement costs of customer industries through reduced material prices, as a result of process innovation in the chemical industry; and by enabling sustainable growth through more energy-efficient processes.

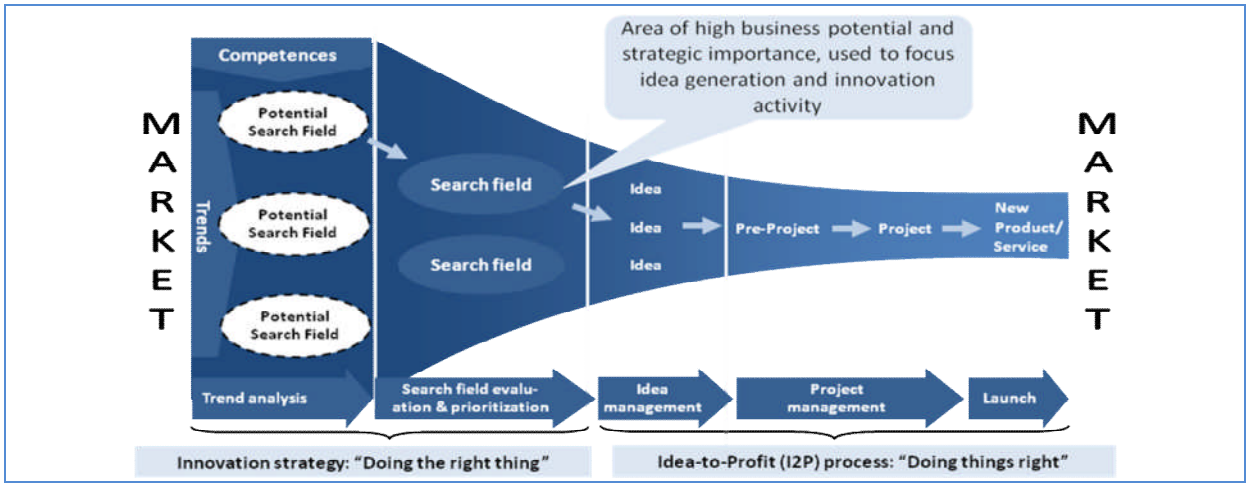
The policy brief identified the following areas as having a major disruptive potential:

- Process intensification
- Alternative feedstocks
- Advanced materials
- Developments in nanotechnology

He concluded that the central objective for any policy responses to these disruptive innovation trends should be that Europe must take a pro-active approach to maintain its role as an innovation leader, in particular in cutting-edge domains which may have disruptive impacts in different areas of the economy. To achieve this, a systemic approach is needed, encouraging large scale, cross-sector innovation activities. A specific challenge in this context is to develop the "societal business case" for migrating to more energy-efficient technologies, which can require capital write-offs. The costs must be shared in a fair way among stakeholders.

Michael Dröscher, Cluster Manager of CHEMIE.NRW and Vice President of the German Chemical Society, gave a practitioner's view on innovation processes in the chemical industry. He argued that five categories of macro trends would have an important impact on the global business environment for the chemical industry: globalisation, demographics, consumption patterns, environmental & natural resources, and regulation/activism. He then explained typical innovation processes in the chemical industry, which covers the whole value chain from basic chemicals via the further processing industries to the manufacture of consumer and investment goods (e.g. cars).

Professor Dröscher then analysed critical success factors for innovation. These include competencies ("people are the most important success factor") , skills in innovation management, open innovation (collaboration), system integration, solid IP management and the innovation 'culture' in companies. He explained that innovation management has to start with a thorough analysis of today's product portfolio with regard to the life cycle. Chemical companies must ensure they have sufficient innovative products in their pipeline to compensate for decreasing returns from products which are at the end of the life-cycle, as only few of the ideas generated will finally make it to commercial products.



Discussion

A central point in the discussion was the question how important it was to keep R&D activities of companies as much as possible in Europe. Mr. Dröscher argued that this must be a central objective for policy, as the commercial exploitation (and thus value creation) –once the new products or processes get into the market– is likely to start in the area where they have been developed. Thus, if chemical companies relocate their R&D activity to Asia or other countries, these economies are likely to reap the benefits later on. Some discussant took a slightly different view and argued that it makes sense for European companies to conduct part of their R&D in other economies, and that this would strengthen their competitiveness without necessarily hurting the European economy. They compared it to relocating parts of the production process.

It was also discussed whether the primary objective of innovation policy should be to strengthen the chemical industry in Europe, or rather focus on maximising the indirect impact in its client industries. Due to the specific role of the chemical industry as a catalyst of innovation, this is not entirely clear.

The discussion also focused on specific challenges to innovation in a capital-intensive industry which cannot simply switch from one production process to another. Moreover, as 90% of the inputs still depend on oil and gas, there is still a high dependency on non-renewable raw materials, in spite of all efforts to develop substitutes.

It was suggested that technology road-mapping could be an important and helpful instrument to provide a better basis for taking decisions about investments, and that the Commission could coordinate and foster such activities.

2.4 Disruptive innovation in service sectors

This session focused on the innovation and its disruptive impact in two service industries – tourism and transport & logistics. In both industries, the internet has had a profound impact on business processes and service provision, but in a fundamentally different way than in the manufacturing sectors discussed before. The focus here is not so much on R&D and developing new technology, but on new business models stemming form innovative uses of existing technology. With the coverage of services in this workshop, the organises acknowledged the importance of service sectors for employment in Europe. Tourism accounts for almost 10 million direct jobs in Europe (5% of the workforce), the transport services sector in employed around 9 million persons in the EU-27 (about 4.5 % of the workforce).

Presentations

Markus Lassnig, Deputy Head of the competence field eTourism of the InnovationLab at Salzburg Research GmbH, discussed five major trends in tourism:

- Online bookings
- Dynamic packaging
- Yield management
- Rating portals
- Low-cost airlines

While all of them are important for the sector, his assessment was that only two of these trends had considerable disruptive impacts: the migration to booking touristic services online, and the entry of low-cost airlines.

- Close to 40% of touristic bookings (hotels and tickets) in Western Europe are made online. The internet has had a profound impact on value networks in the sector. It is a threat for travel agents and tour operators, has led to the market entry of new intermediaries (online platforms) and offers opportunities and risks for hotels at the same time.
- The emergence of no-frills airlines has strongly reduced average fares in European air travel – also the fares of full-service airlines which had to adapt somewhat to the new level of pricing with ever more price-sensitive customers. In this way, no-frills airlines have strongly transformed the industry.

The speaker concluded that, by and large, the major innovation trends in tourism as discussed in this section should present opportunities for the European tourism industry in the global competition of destinations rather than threats. He did not see a need to adapt conventional innovation policy schemes in response to these trends. The strategic response of economic and innovation policy should consist in creating positive framework conditions for European tourism companies to adopt these innovations.

Pietro Evangelista, senior researcher at IRAT-CNR and the University of Naples Federico II, presented an assessment of disruptive innovation trends in the transport and logistics industry. He explained that innovation in freight transport means either improvements in speed, capacity, efficiency or the geographical coverage of transport systems. He argued that the only innovations with a truly disruptive impact, in the past 50 years, were the introduction of commercial jet planes and of containers in the late 1960s. The most important innovation in logistics service provision he sees today is the increasing integration between the client and the logistics service providers, as not only the operations, but also the planning and control of the whole logistics process tends to be outsourced. The speaker described three waves in this process:

- In the 1970s/80s, mainly the *execution* of transports was outsourced to carriers.
- In the 1980s/90s, the *control* of the process was also outsourced to 3PL (third party logistics providers)
- Since 2000, there is trend towards also outsourcing the *planning* of operations to 4PL / LLP.

ICT plays a critical role as enabler in this process and service innovation. The main impact on the sector stems from the market entry of new players (e.g. in e-marketplaces) and new alliances or new business models that are facilitated by these developments, e.g. the emergence of 4PL. There is a dichotomy between the large logistics companies and SMEs, however; large multinational 3PL groups have heavily invested in ICT and gain substantial competitive advantages from this, while SMEs still do not make adequate use of ICT. He recommended that innovation policy should focus on promoting ICT use among SMEs in the sector, e.g. by promoting e-skills among the workforce.

Discussion

The workshop participants broadly agreed with the assessment of the speakers with regard to the observed trends, in particular that business model innovation had the highest impact in the presented sectors. It was suggested that the public sector had an important role to play by establishing infrastructure and creating the right regulatory framework conditions so that innovative service sectors can thrive.

Specifically for the tourism sector, it was also suggested to consider innovative mobile applications and services enabled by smart-phones as another innovation trend, for example location based services or online guides enhanced through information from tourists (peer reviewing etc.).

2.5 Conclusions for innovation policy

The final session summarised possible implications stemming from the observed innovation trends for innovation policy beyond a specific industry. **Simon Robinson**, Director of empirica, suggested four strategic responses for policy to deal with disruptive innovation and foster the innovativeness of the European industry:

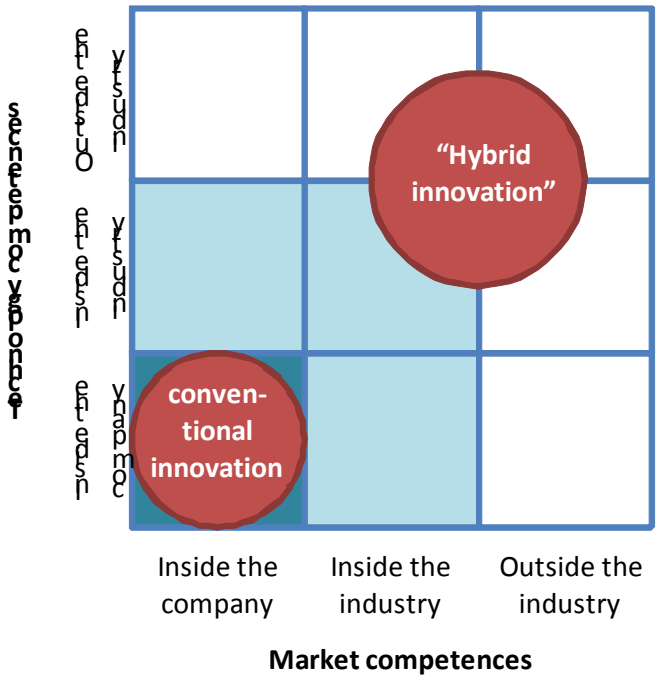
(1) Addressing the cross-sectoral nature of disruptive innovations

(2) Dealing with 'business case conflicts'

(3) Anticipating unwanted side-effects of interventions

(4) Understanding disruptive innovation in service sectors

A central point in the discussion was the common feature of many disruptive technologies that their development requires know-how –both technological and market know-how– from different industries. In this way, they can be referred to as "hybrid innovation" (see figure), in contrast to conventional innovations which are developed and applied within a singly company (or collaborative innovations within one sector). Advancing such hybrid innovations may require innovative policy mechanisms, e.g. establishing technology platforms involving stakeholders from different industries. This concept is related to the 'open innovation' concept, but has an even stronger focus on the cross-industry aspect.



Source: Dröscher (2009) / Evonik Industries

Participants agreed that the support of inter-sectoral cooperation networks or platforms to promote hybrid innovation was an important issue for further consideration. They also made some specific suggestions such as:

- Awareness raising for disruptive innovation trends is important.
- Reaching SMEs: the EC can reach the large enterprises, but SMEs must be contacted on a regional basis through intermediaries (regional development agencies, SME support centres).
- Spotting the discontinuities is a big challenge (as we "cannot imagine what we do not know"), but nonetheless important – technology foresight and road-mapping activities are instruments to address this challenge; policy should make use of those.

Contact and further information

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About INNO-Grips (Global Research on Innovation Policy Intelligence)

This workshop is organised under Lot 1 of the "INNO-Grips" work programme (http://www.proinno-europe.eu/innogrips2), which is one of the pillars of the European Commission's "PRO INNO Europe" initiative (http://www.proinno-europe.eu). INNO-Grips Lot 1 gathers evidence on innovation policy developments worldwide and analyses specific aspects and trends in more detail. The services of the current INNO-Grips period are provided by empirica GmbH, Bonn (http://www.empirica.com) in cooperation with ICEG European Center, Budapest (http://www.icegec.hu), based on a contract with the European Commission, DG Enterprise and Industry. The current service period is running from February 2010 to January 2013.

3 Annex: List of participants

	Title	Name	Country	Organisation / Company	Position
1	Mr.	Arnold, René	Germany	IW Consult	Researcher
2	Dr.	Chobanova, Rossitsa	Bulgaria	Bulgarian Academy of Sciences, Institute of Economics	Senior researcher
3	Ms.	Colombo, Daniele	EC	DG Enterprise and Industry	Chemicals - G2
4	Ms.	van Daal, Saskia	EC	DG Enterprise and Industry	
5	Prof.	Dröscher, Michael	Germany	Chemie.NRW, Degussa/ Evonik, University of Munster	Cluster Manager
6	Dr.	Ellermann, Lutz	Germany	Freelance consultant	Innovation consultant
7	Mr.	Eskola, Antti	Finland	Ministry of Employment and the Economy, Innovation Department	Senior Policy Advisor
8	Dr.	Evangelista, Pietro	Italy	IRAT-CNR, University of Naples Federico II	Professor of business economics and managememt
9	Mr.	Haugness, Thor	Norway	Infosector	Innovation consultant
10	Dr.	Hjelt, Mari	Finland	Gaia Group Ltd.	Partner
11	Mr.	Jerzyniak, Tomasz	EC	DG Enterprise and Industry	Policy officer
12	Dr.	Kamp, Bart	Belgium	INNOVA Europe	Senior project manager
13	Mr.	Lang, Alexander	Germany	IMAN Solutions GmbH	CEO
14	Dr.	Lassnig, Markus	Austria	Salzburg Research GmbH	Deputy Head, competence field eTourism - InnovationLab
15	Dr.	Leo, Hannes	Austria	cbased - Community Based Innovation Systems	CEO
16	Ms.	Leon, Emilio	EC	DG Enterprise and Industry	Automotive Industry - D5
17	Mr.	Martel, Allan	Canada	Allan Martel Consulting	Innovation consultant
18	Ms.	Puolamaa, Maila	EC	DG Enterprise and Industry	Chemicals - REACH / G1
19	Mr.	Robinson, Simon	Germany	empirica GmbH	Director
20	Ms.	Sass, Magdalena	Hungary	ICEG EC	Senior researcher
21	Ms.	Schiffer, Marleen	Germany	IW Consult	Researcher
22	Mr.	Selhofer, Hannes	Germany	empirica GmbH	Senior consultant
23	Dr.	von Stamm, Bettina	UK	Innovation Leadership Forum (ILF)	Director and Catalyst
24	Prof.	Suomi, Reima	Finland	University of Turku	Professor of Information Systems
25	Ms.	Toncu, Cristina	Romania	gea strategy & consulting	Consultant
26	Dr.	Tueske, Rita	Hungary	Ministry for National Economy, Department for Industrial Strategy	Head of Division Technical Regulation