Revolutionizing EU Innovation Policy

Pioneering the Future

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Revisiting Innovation: Revolutionizing European Innovation Policy by means of an Innovation Ecosystem

Klaus Gretschmann and Stefan Schepers

1. THE EU IN NEED OF A NEW NARRATIVE

Both in economic and political terms, the EU is on life support. Its former attractiveness as an economic powerhouse, a political "soft power" and a much appreciated social model seems to be waning in the face of Eurozone troubles, the problems of migration and asylum seekers or the political and military challenges at its borders. Far away from traditional integrationist thinking which claims that the EU has always been on an irreversible trend towards an ever closer union, today's analysts hold that the Union is losing its internal coherence, its historical significance and economic usefulness.

For many decades EU politicians have followed the guiding star of an ever closer union pursued by one method, supra-nationalism, without ever trying seriously other approaches, and ignoring the complex nationalities. However, recent crises have effected a sharp drop in the Union's attractiveness. For a variety of reasons, the EU has become most unpopular with her Member States, peoples and citizens. This is not merely due to the fall-out from the financial and eurocrises, but rather the Union suffers from self-inflicted damage resulting from its contested, some-

times self-serving, goals and governance methods and culture of the past. Both have been made obsolete by new realities.

Political systems fray and decay Europe-wide. An increasing number of Member States are afraid that they may face "ungovernability" with dramatic consequences for the social and political glue holding the Union together (Gretschmann, 2015).

Indeed, these appear to be the most testing and taxing times for the EU during its existence. Reasons for growing Euroscepticism abound. At its very heart seems to be the perception by the people in the streets that an elitist power cartel of pro-European agents with disregard for the real problems citizens all over the Union are facing has developed and has started a "power grab" from national governments beyond what is laid-down in the Treaties. They feel disempowered, alienated and subject to forces they cannot control (Gretschmann, 2014).

The EU in stormy seas is in urgent need of a new and attractive narrative, a positive, encompassing story to tell and a fresh idea to follow. It requires a recipe for pioneering the future and bringing attractiveness and popularity back in. In order to be prepared for the challenges of the future, deep-running changes will have to be considered and paradigm shifts will be required: away from 'bureaucratism' towards citizens' preferences, away from the 'routinism' of the Community method towards 'innovationism', away from walking the beaten tracks towards new paths of revised principles and open and fluid structures of decision making. Talking about change while continuing in the old ways will not do!

The EU's internal cohesion will have to be restored, the European Common Good which seems to be fading away needs to be re-called, and last but not least Europe as a whole, which is still lagging behind more active and agile emergent economies, needs overhaul and modernization.

All this implies revolutionizing the model of EU policy making, both in design and implementation, and to restart with new concepts and blueprints of reform.

What seems to the authors and contributors to this volume a most attractive narrative of next Europe will be built on knowledge, education, research, technologies and in short: INNOVATION.

In order to make use of such a narrative, we may need to revolutionize European innovation policies in order to move ahead towards a **European Age of Innovation** and a European Innovation Agenda.

2. COMING A LONG WAY FROM EU R&D TO INNOVATION AS A PROMISE

To be sure, Europe and notably the European Union has always been interested in Research, Science and Innovation as a means of modernizing the European polities and economies.

Whereas the early years of the European Communities did not see much in terms of research policy *(Guzzetti, 1995)* except for some limited activities within the confines of the Euratom Treaty – a first push[1] occurred with the acknowledgement in the late 60s that Europe suffered from a huge technology gap vis a vis the US and Japan. The seminal work of Jean-Jacques Servan-Schreiber (1968) about "Le défi americain" paved the way for thinking hard about what to do in order not to lose ground in international economic competitiveness. The result was a decision to pool resources and to synchronize national efforts in order to:

- generate a genuine European value-added on top of national research benefits;
- provide cross-border, Community-wide transparency and "usability" of research results;

- guarantee the critical mass necessary for large research projects, infrastructure and funding;
- to tie together transnational and interdisciplinary research;
- to avoid duplication of the same research efforts in several Member States;
- to kick-start projects by providing funding from European sources;
- to exploit EU wide economies of scale;
- to activate, promote and strengthen new research areas and activities of strategic importance for Europe's competitiveness vis a vis the US and Japan.

However the approach was piece-meal at best. Innovations were connoted with universities or select enterprises or individual geniuses and inventors. Market forces alone were believed to steer and guide technology development and innovations either by demand pull or supply push. Market failures were the only legitimate reason for public policy to interference. How far government involvement was to go was contested. Picking the winners by subsidization was no accepted strategy. And ever since, "innovations" have always been misunderstood in Brussels as just an extension of R&D programs.

Along these lines, during the last 20 years the European Union has further developed a research and development (R&D) policy and it has tried to make it complementary to the research and innovation efforts of the Member States. Some progress has been made but it is still too slow and too limited to have a distinctive and lasting effect on Europe's growth and competitiveness. $R\&D^2$ does not automatically lead to innovation in markets; intervening and flanking factors, such as legal provisions (EU and national ones), administrative support, entrepreneurial skills, risk propensity and public opinion, etc., are not conducive towards an innovation environment

and need to be addressed and tackled simultaneously. Concomitantly, the removal of bottlenecks and obstacles to innovation has always been a tall order.

Whilst innovation is widely considered as a key element to foster growth and prosperity and would **excellently qualify for nurturing a new narrative of the EU**, the recent stalemate, if not outright decline, in Europe's innovation record and in its investments in RDI (Innovation Scoreboard various issues[3]) demonstrates that Europe is far from achieving its full potential and has to overcome many impediments and barriers, notably:

- a disconnection between European governance and business interests and value chains;
- an exceedingly precautious approach to new ideas and inventions;
- a neglect of public government innovation.

Commitments to politically stimulate and increase investment in research knowledge and innovation have been increasingly made ever since and notably over the past 10 years or so but have never been met in full. Evidently **creating** innovation, **commercializing** innovation and **leveraging** innovation is easier said than done.

In parallel, theoretical and empirical research on innovation policy has gone from the recognition that innovation is decisive (exogenous growth models) and the study of innovation mechanisms (micro and sectoral) to the modeling of evolutionary and path dependent processes and the interplay of technology and institutions. Such research and its findings (Kok, 2004; Mc Kinsey, 2004; Aho, 2006) have not been taken into adequate account so far by policy makers. A lot has been said and done about an encompassing approach involving for example ERC, EIT, JTI, Lead Markets or CIP[4], about stakeholders, shareholders, producers, facilitators, knowledge workers, skills

providers and so on, but without much success and praise, not least due to lack of policy coherence!

Admittedly, we have come a long way. It has become general knowledge that (Member) States should develop their innovation policies in the light of their specific characteristics and *inter alia* with the following objectives: establishing support mechanisms for innovative SMEs, including high tech start-ups, promoting joint research between undertakings and universities, improving access to risk capital, refocusing public procurement on innovative products and services and developing partnerships for innovation and innovation centers at regional and local level. And the icing on the cake would be a nice and attractive framework tying the national and local efforts together with the EU level.

3. TOWARDS REVISITING INNOVATION IN EUROPE

The European Union needs a *new grand vision* which can motivate people. Such a grand new vision could be founded on an *innovation paradigm*. Developing an *ecosystem of innovations* should be the overarching objective of the EU and of the Member States for the next decades in order *to guarantee and promote the best possible living conditions for the largest number of citizens*. It appears clear that a narrative built upon an *innovation paradigm* can offer a non-conflictual, highly consensual and attractive new compact, containing the glue for tying Europe together and integrating national and Union interests.

Innovation in all its guises is needed to manage the critical economic and societal issues of Europe of the first half of the 21st century, such as resource efficiency, climate change, healthy living and aging, food, energy and resources security, and to make it possible: governance methodology and culture. Without it, the maintenance and furtherance of the European welfare model

will be in jeopardy.[5] Innovation is an indispensable source of competitive strength and a precondition for Europe's model of 'soft power' in world affairs (Tuomioja, 2009).

However, in Europe, different cultural and sometimes ideological perceptions, and differing public governance or management fault lines, in particular between (and sometimes inside) the EU institutions and Member States, hinder making efficient use of available intellectual capital and economic capabilities. Indeed, economic innovation requires much more than research which may lead, or not, to a new or improved product or use. It concerns also new methods of production or delivery of services, the development of a new market, or finding a new source of supply of raw materials or manufactured inputs, or new design, or a new organization of industry, of management or of public administration. Therefore, a traditional R&D approach to innovation is insufficient and ineffective and must be broadened to cover non-technological innovations, including in the regulatory frameworks, procurement procedures, or intellectual property rights and standardization, to name but a few.

The emergence of novel concepts and products is often a result of improvisation, repeated trial and error, the emergence of new tacit and explicit knowledge until some form of consolidation takes place. Innovation thus is a paradoxical process, combining the unknown, creativity and rigorous scientific method. It requires the opposite attitude from bureaucracy, which is about stable process and control in large entities; if it comes too early in innovation processes, it leads to inertia. But also beyond "managed innovation" independent thinkers, amateurs and dreamers often provide the indispensable imaginative leaps, the fantasies and intuition which are often more useful than the much-praised "analytical rigor" when it comes to new ideas and innovations. Attempts to trigger non-conventional thinking and to open new both in universities, firms and politics, but also in civil society organizations, are still both a desideratum and a priority. A quadru-

ple helix is far away still. Moreover, leadership and support in government systems is needed to create the optimal framework conditions to facilitate other actors, primarily but not exclusively companies and universities, to develop and manage the chain of actions which leads to innovation of products, services and processes in the market.

Modern political leadership for innovation requires vision, strategy, consistency, and proper governance cultural and tools. It needs to pay attention to the whole chain of knowledge development in its broadest sense, to diffusion and absorption and to its transformation in tangible applications, which bring economically and socially measurable benefits.

In the EU, innovation requires first of all to move beyond a culture of regulation and control towards a culture of mentoring and coaching of all actors and stakeholders. Stewardship tools are more suited to promote a culture of innovation and of change among various actors than traditional command and control approaches, which usually stifle diversity and creativity, two key ingredients for innovative thinking. This requires a real change of culture.

The analysis above pinpoints the crucial role of institutional arrangements as driving or at least supporting forces to innovation. The two forces of technology innovation and institutional innovation are deeply intertwined since new inventions, innovations and technologies frequently are the source of disequilibria which make it profitable or even indispensable to innovate institutional arrangements (North, 1990). North defines institutions as “humanly devised constraints that structure political, economic and social interactions.” Constraints, as North describes, are devised as formal rules (constitutions, laws, property rights) and informal restraints (sanctions, taboos, customs, traditions, code of conduct), which usually contribute to the perpetuation of order and safety within a market or society. Briefly stated, his works specify the process by which social, economic or political actors perceive that some new form of systemic organization (institutional

arrangement) will yield a stream of benefits which makes it profitable to undergo the costs of innovating this new organizational form. These new arrangements are typically apt to realize potential economies of scale, reduce information costs, spread risk, and internalize externalities.

What may be drawn from the above is the necessary condition of alignment between inventions, innovations, technologies and institutional settings – involving governance regimes (private and public).

Today, governments' role in innovation grows (Mazzucato, 2013): Governments will increasingly become involved in technology, investing in a broad range of applications – from home-grown innovation incubators to local manufacturing sites that create jobs and manage geopolitical risk, not to mention potential ethical or civil rights issues about the use of new technologies. At the same time, governments shouldn't forget their regulatory role, but rather, one adapted to the post-industrial economy and society. It also opens up new possibilities for institutional reform and governance innovation: As the innovation regime as well as governments' policies are becoming increasingly multi-layer, multi-actor and hyper-complex, new modes of governance, citizens' participation and transparency will be part of any innovation-promoting regime.

If the Douglas North proposition above can stand scrutiny, namely that every innovative technology/process requires an adaptive and transformative government, i.e. new institutional arrangements and new governance tools and regimes, then innovations in the public sectors while also having regard for the political structures and processes will be indispensable.

4. THE ROLE OF BUSINESS, THE STAGE-GATE-MODEL AND BEYOND

That business is assigned a crucial role in the process of turning inventions and research results into innovations ready for the market is a truism. Equally well-known is the saying/adage that research policy serves as a means to turn money into knowledge and innovation policy is a way to turn knowledge into money. And last but not least there is no doubt that institutional and policy adaptations need to take the processes of innovation carried out by business into account!

The classical innovation process inside enterprises consists of idea generation, idea selection and idea/project management. The standard process for innovation management focuses on linear non-disruptive incremental innovation. The sequencing is described in the well-known Stage-Gate model (Cooper, 2001/2008). Stage-Gate is a value-creating business process and risk model designed to quickly and profitably transform an organization's best new ideas into winning new products. It enables firms to create a culture of innovation excellence - innovation leadership, top notch teams, customer and market focus, robust solutions, alignment, discipline, speed and quality.

The process helps prepare the right information, with the right level of detail, at the right gate to support the best decision possible, and allocate capital and operating resources.

FIGURE 1.1 HERE

There is no question the Stage-Gate process has had a significant impact on the conception, development and launch of innovative processes in firms. Yet, there have been consistent criticisms of it, as the world of innovation has moved on. Today it is faster-paced, less linear, far more competitive and global and has become less predictable. The process of innovation is much more

iterative than assumed in the SGP. Therefore, the model does not mirror innovation reality in the 21st century firm.

In a very recent empirical study Sarah Eckardt (2015) argued that the most crucial determining factor in firms' innovation processes is intrapreneurship.

Intrapreneurship (entrepreneurship within existing organizations) has been of interest to scholars and practitioners for the past two decades. Intrapreneurship is viewed as being beneficial for revitalization and performance of corporations, as well as for small and medium-sized enterprises. The concept refers to pursuing and entering new businesses, to the creation of new products, services, and technologies, to strategy reformulation, reorganization, and organizational change and finally, to the pro-activeness in pursuing innovations, competitiveness, initiative, risk-taking, and competitive boldness.

In a similar vein, Ahuja, G., Lampert, C.M. (2001) presented a model that explains how established firms create breakthrough inventions. They identify three organizational pathologies that inhibit breakthrough inventions: the familiarity trap – favoring the familiar; the maturity trap – favoring the mature; and the propinquity trap – favoring a search for solutions near to existing solutions. They argue that by experimenting with novel (the firm lacks prior experience), emerging (technologies are newly developed), and pioneering (technologies that do not build on any existing technologies) developments firms can overcome these traps and create breakthrough inventions. However, outside help through adequate innovation and technology policies may be supportive.

From very early on, Damanpour (1991) inquired into the factors determining innovation propensity and capacity in firms. A meta-analysis of the relationships between organizational innovation and thirteen of its potential determinants resulted in statistically significant associations for spe-

cialization, functional differentiation, professionalism, centralization, managerial attitude toward change, technical knowledge resources, administrative intensity, slack resources, and external and internal communication. Results suggest that the relations between the determinants and innovation are stable over time.

To focus on the innovation processes at the level of the firm is no *mental gymnastics*; rather it is absolutely necessary to be aware of how innovation works in business and thus in practice. Taking account of the basic intrafirm features is a prerequisite if (European) innovation policy wants to make a difference and contribute to bringing about innovations. A skillful alignment between policy and business processes is imperative for any innovation policy to work. If the firm approach is complex and multi-dimensional, the (former) linear concept of EU innovation policy making and its implicit affinity to the SGP is no longer adequate. (See the contribution of Egbert Lox in this volume). Rather, a more complex and multi-layer approach (Christensen, 2000) such as an innovation ecosystem (Jackson, 2011) approach is badly needed.

5. SHORTCOMINGS OF PRESENT EU INNOVATION POLICY APPROACHES

- The success of the EU integration and cooperation process has led to such a high degree of complexity that the original methods of operation are no longer suited. There is an urgent need to re-think, within the confines of the Treaties, how to bring about comprehensive stakeholder engagement and how to make this operationally possible through behavioral and procedural change and digitalization. In order to ensure policy coherence not just within the Commission but also between the EU and Member States, new approaches to impact assessment, to policy elaboration and to rule making and rule application in diverse contextual conditions must be found. In addition, the needs of the drivers of competitiveness and employment creation, industrial and

service companies must become better aligned with the interests of national governments, visions and welfare requirements.

- The gaps in competitiveness between Member States are widening, with some advancing well in developing and implementing innovation in their economy and governance, others still at the stage of planning and piecemeal implementation, and still other countries just thinking what to do, if anything. The European innovation ecosystem will become globally strong only if it is internally coherent and if all countries attain a minimum level of integration within it.

- It is clearly a collective European interest to ensure that all productive and innovative forces and opportunities are identified and used. This requires structural reforms in most if not all Member States and in the EU itself and a different use of EU instruments and funds to ensure that an innovation level playing field is rapidly created.

- The EU needs to organize technological and industrial cooperation in all sectors and across all regions. This requires a diversified yet strong approach for building new industries and European players of international standing as well as strengthening the ecosystem for innovation and investment. The pledge made in the Lisbon Strategy, viz. that "the main role of industrial policy at the EU level is to provide (…) the right framework conditions for enterprise development and innovation" is still not met in full.

- A key problem underlying the sub-optimal design of EU innovation policy is the supra-national governance model of the EU, once useful for creating a common market and a single currency, but unfit for today's new challenges. It focuses far too much on regulating everything instead of operating with more sophisticated collaborative governance methods. Moreover, once it has opened a particular regulatory trajectory, it continues on it without regular and thorough evaluation of its effectiveness. No wonder European companies, and most of all small and medi-

um sized ones and innovative start-ups, suffocate under complex, sometimes contradictory, shaky and time-consuming regulations which benefit no one and do not stimulate research and innovation nor competitiveness or employment. Political debates tend to focus too much on 'more or less Europe', but not on the cost-efficient functioning of its policy-making system, now designed half a century ago for a different political and economic context.

- What is badly needed is collaboration between research, business, governments and the EU Commission, instead of silo thinking by each of them and mutual distrust. We must also dare to question regulatory capture in Brussels by a select number of NGOs with their own agendas whose impact on growth and employment is unclear to say the least. Instead of fragmenting responsibilities for research, education and enterprise policy, governments and the Commission should ensure convergence and cooperation, because they are the three pillars of global competitiveness on which the public income depends to finance Europe's cherished social model.

Europe does not lack the capacity to innovate; it has a broad fabric of innovation with certain elements already in place; but the framework conditions are lacking. It is confronted with problems of leadership and incoherence of vision and purpose. It struggles to create cumulative effects and critical mass. There is a rather inflexible culture of policy-making and regulatory application. It suffers from organizational fragmentation, with multiple barriers to innovation in markets, and there is no encompassing systemic approach. Worse still, some innovation that is developed in the EU is appropriated elsewhere due to a lack of favorable framework conditions.

6. INNOVATION ECOSYSTEMS: REVOLUTIONIZING INNOVATION POLICY

Innovation is the result of interaction amongst "ecology" of actors. The "right" interaction between these actors is needed to turn an idea into a solution or a process, product or service on the

market. Therefore, the European Innovation Strategy model focuses on connectedness, the dynamics and the context in which a complex interaction of actors and agents, factors, sectors and countries determining or hampering innovation is embedded.

We must acknowledge that innovation results from a complex process, combining curiosity, creativity, rigorous scientific method and a suitable institutional framework of interaction. The emergence of novel concepts or processes, products or services, can only result from out-of-the-box thinking, improvisation, trial and error, and new tacit or explicit knowledge.

The traditional model of innovation uses scientific research as the basis of innovation, and suggests that change is linear: from research via invention to innovation, to diffusion and marketing. However, this model has been acknowledged as incomplete and misleading. Rather, innovation is a result of the interaction amongst an "ecology" of actors. It is the "right" interaction between the actors that is needed in order to turn an idea into a solution or a process, product or service on the market or in society.

The ecology model, first sketched out by Jackson (2011) provides a much richer picture of how innovation works, and how it can be stimulated and fostered. It focuses on connectedness, the dynamics and the context in which a complex interaction of actors and agents, factors, sectors and countries determining or hampering innovation is embedded. Innovation and value creation require permanent strategic agility (Doz and Kosonen, 2008), scanning the global context, scouting for opportunities, and attention to continuities or discontinuities in societies and economies.

We suggest in this volume the deployment of "innovation ecosystems", i.e. a set of ideas, institutions, instruments, policies, regulations and factors that determine the level, direction, outcome, productivity and degree of competitiveness from innovations. A realm characterized by clear, simple, efficient, smart, low-complex, competition-based and socially-accepted features will be

best-suited and conducive to prompt and promote innovation. Whereas the traditional linear model of innovation prioritizes scientific research as the basis of innovation, the model put forward in this book provides a much richer picture.

FIGURE 1.2 HERE

The key objectives are to develop and promote an ecosystem of innovation that embeds innovation policies and activities into a flexible, dynamic, stimulating and enabling environment. This ecosystem is intended to create value for society. It should enhance the quality of life for its citizens and the competitiveness of its enterprises. It should foster intelligent interaction between a variety of stakeholders (whether companies, local/regional/national authorities, or international systems like the EU and its institutions) and centers of knowledge-creation such as universities and research organizations.

Reconstructing and unfolding the European innovation ecosystem will involve setting up:

- a **network of formal and informal** public and private sector actors whose activities and interactions initiate, import, modify and diffuse new technologies;
- the **communication flows and relationships** that determine the production, diffusion and use of new basic or applied, knowledge;
- a set of **individual actors**, whose incentive structures and competencies determine the rate and direction of technological learning and the volume and composition of change generating activities;
- **devices to create, store and transfer knowledge**, skills and artefacts which define new technological frontiers;

- **rules and political arrangements** for the framework guiding the innovation process, with particular attention to rules or practices that could hinder an innovation ecosystem;
- **a heterarchical[6] governance culture,** to develop stakeholder alignment and quadruple helix innovation;
- **a set of workable regulations** where non-functioning elements are repaired and adjusted to foster creative thinking and invention;[7]
- **more space for regulatory interpretation** so rules are applied on the basis of reality evidence – less dogmatic and more flexible with regards to achieving desirable outcomes.

Once set up, this framework is supposed to ensure:

- a cross-disciplinary and open-minded attitude;
- a reasonable but adequate propensity to risk;
- strategic foresight, policy coherence and flexible governance.

In order to guarantee the functioning of the system, a complete revision and continuous monitoring of the methods, procedures and output of governance within the various EU institutions and all Member States, as well as of the interaction between themselves, and between them and the EU institutions, must also be achieved.

Building on those elements, the ecosystem will promote creative and bold thinking, free from useless bureaucratic constraints and able to achieve innovative solutions and eventually capable of addressing new challenges and specific problems.

The basis for innovation ecosystems requires:

- openness and dialogue about the agendas of different stakeholders;

- overcoming short-termism through appropriate processes and steering to build coherence and alignment within and between complex large public and private entities (corporations, governments, universities etc.) about mission and objectives and about interdependence of respective roles to achieve mega societal objectives;
- understanding of how industrial dynamics and market functioning operate, how they can respond to economic and societal needs and demands, and which framework conditions are required to turn these into business opportunities;
- attention for the important role of creativity and for the innovation potential in so-called traditional industries and in agriculture;
- attention to the potential of young innovators and their needs and the removal of obstacles to start-up companies, including unintended side-effects of certain forms of taxation;
- promoting entrepreneurship through lower entry costs and through fundamental changes in national bankruptcy laws;
- understanding the key role of public governance in putting the right framework conditions in place and hence the need for meaningful public administration innovation;
- understanding the (often global) research - (radical or incremental) innovation chain, its funding costs before and at the point of market entry, and the timeframe in different business sectors, and development of a comprehensive intellectual property protection;
- understanding the symbiotic relations between large corporations and small and medium sized enterprises;
- result oriented cooperation between public authorities, companies and university research capabilities, with a preference for coaching over command and control functions, and ensuring engagement through a variety of incentives for all actors;
- interpretation of existing regulations in a way which stimulates innovation;

- ❖ stable and coherent policy and regulatory frameworks, with minimum costs and fast procedures, which increase the probability of market success of innovation and hence facilitate its financing.

Because there is a certain probability that at least some enterprises launched in the ecosystem will fail, a healthy ecosystem should be structured to handle failures in a way that encourages cutting investment losses in the early stages of the enterprise. Ideally, the ecosystem is structured to recover and recycle resources (including human capital) that are released upon failure of an enterprise (Jackson, 2011, 8). Therefore, besides assembling the actors who will contribute to the innovation ecosystem, a healthy ecosystem also provides a mechanism for building relationships and other intangibles between the actors, and entities within the ecosystem and those inside and outside the system.

To properly assess paradigm shifts and to align various agendas, it is essential to involve business leaders and other economic actors together and in close cooperation with the centers of knowledge creation, to contribute their understanding of markets and marketability. To make use of different perspectives and different modes of thinking and probing, we will need to establish a culture of deliberation and discourse. We will need tools that go beyond the technocratic and mechanistic stakeholder consultations which are the routine in Brussels. It is necessary in order to bring about a shared vision and mutual understanding and cooperation. If the EU wishes to promote and stimulate innovation, it needs to be innovation-bent itself – much more so than in the past.

We are in the midst of a major paradigm shift: the old approach to innovation policy no longer works and the new approaches are not matured enough yet. As a matter of fact, i**nnovation ecosystems** as social environments offering an all-encompassing and coherent policy strategy re-

garding innovation, permeate quite a lot of other areas, such as enterprise policy, smart regulation, affordable health, social reforms and new ways of molding EU national policies.

The upshot of the line of argumentation rolled-out above is as follows: Both politics and business need to create and provide the right "innovation ecology", a laboratory of ideas, rules, procedures etc. across disciplines, firms and countries. This requires that stakeholders, shareholders, producers, facilitators, decision-makers, knowledge workers, skills providers etc. should all be involved and committed. **Then the innovation ecosystem approach may well be the best basis of a new narrative of a future Europe.**

7. A PLAN OF THE BOOK AND ITS RATIONALE

As argued above, a whole set of largely unrelated individual initiatives does not make up an innovation system. Indeed, the EU and its Member States have developed policies, programs and projects to make innovation in Europe thrive. They have managed to develop an encompassing program such as Horizon 2020. However, so far the outcome is far from optimal. Stakeholders in science, business and society alike remain skeptical and critical, to say the least.

Radical change in innovation policy seems indispensable, from fragmentation to coordination, from a narrow S+T orientation to an encompassing, holistic and coherent strategy involving several policy areas, from a diffuse to a highly focused division of labor between all actors and stakeholders involved. This is what we mean by the Innovation Ecosystem Approach.

As outlined above many of the major issues deserve quite some more elaborate and in-depth analysis and reflection. In the following chapters the various authors and contributors will try to live up to this desideratum:

Benefits and rewards of innovation policies are the centerpiece of Morten Rasmussen's contribution: He explores the link between innovations and national macro-economic parameters such as international competitiveness, growth and employment, budgetary balance etc. The paper compares cross-country studies and rankings and deploys performance data and empirical analyses for determining a clear co-variance between innovation-friendly policies, an eco-system conducive to innovation and positive economic performance.

Whereas Rasmussen emphasizes the upside of comprehensive and stimulating innovation ecosystems, Klaus Gretschmann discloses the downsides and analyzes obstacles and opposition to innovation. He describes innovation as placed between "hype, rebuff and new sobriety" and argues that albeit innovation has become the "magic formula" in today's intellectual debates, it is an error to assume that innovations are everywhere and always welcome. There is no such thing as a social consensus or a social compact about the unconditional promotion of innovation. Rather, the history of innovation is an unending story of resistance and opposition. A whole series of factors inhibiting innovation are discussed, such as personal attitudes to risk, intrafirm obstacles, institutional settings, the role of veto players, "groupthink" and "an intrinsic risk-adverse societal attitude" in European societies.

In their chapter on 'Open Innovation and Clusters: why proximity matters?' Alberto di Minin and Marco Rossi underline the significance of clusters for a stimulating innovation eco-system. They focus on three factors which make clusters particularly well-fitted to develop effective and successful open innovation strategies: access to finance, cross-specialization and local trust. The

analysis focuses on how the peculiarly close-knit and cooperative environment which characterizes regional clusters can play a vital role in guaranteeing constant exchange and knowledge disclosure between different actors involved in a network, while at the same time significantly reducing costs. By encouraging this knowledge flow not only between local partners, but also between local competitors, clusters foster the constant exchange of data and solutions that underpin open innovation.

Innovations are produced everywhere but there is wide disparity; whilst some countries or regions are in the top rank in terms of innovation, others are a way away. The challenge to grow faster is to raise "the average level" of European innovation, to create a European ecosystem with the best performers without leaving the rest behind. In this chapter Marisa Poncela analyzes the complexity of the governance system and the need to ensure coordination processes that facilitate long-term strategy planning (and implementation) and prevent short-term decisions that hinder innovation processes, aligning actors, priorities and problems while preserving long-term policy coherence. Mechanisms to ensure horizontal inter-ministerial policy coordination and mechanisms for top-down and bottom-up local-regional-national coordination will be highlighted. The importance of the impact assessments is underpinned and best practices and proposals to catalyze policy-coherence are discussed.

Looking into a particularly important element of innovation, viz. funding and financing, Nicolas Redi and Morten Rasmussen suggest that quite some fresh thinking is imperative in order to overcome financial barriers and frictions and provide the funds needed to kick start innovations. Although steps have been taken to promote financing of innovation and R&D at EU-level, problems persist resulting from fragmented funding and financing, the lack of innovative financing strategies, reduced R&D budgets, and the way the funding is channeled into the market. Against

this backdrop, Redi suggests innovative ways to make use of venture capital funding in cooperation with the setting up of a specific, ear-marked European Investment Fund financing scheme and a new guarantee system to help absorb some financial risks innovations hold for investors.

In the chapter on Collaborative Governance Stefan Schepers argues convincingly that a promising method for promoting innovation requires a fundamental change in the EU's governance approach. As he discusses the nature and past reform efforts of the European Union governance system from an historical perspective he derives the urgent need for change in governance methods and culture in order to anchor innovation into the system. Economic paradigms calling for innovation will have to recognize that without equally significant governance innovation their case is lost. Both forms of innovation facilitate each other and contribute to the Common Good.

Andrew Kakabadse's contribution reasserts that a radical new vision to innovation policy is needed. This vision, based on an innovation ecosystem (ideas, institutions, policies and regulation) can only be achieved through all-encompassing collaborative governance that is interactive and value generating. Kakabadse pinpoints the crucial role of institutional arrangements as well as a governance of alignment of all the driving forces and actors in favor of radical change and innovation, and this also requires innovation in corporate management.

Christoph Bausch questions the ability of the EU system of governance to help business and research to unfold their innovative potential: The European Union is a complex system constituted by a myriad of different actors with often discordant political agendas and interests and a dominant rigid regulatory approach. The central aim of EU governance when it comes to promoting innovation is to reconcile and align such divergence and translate it into solutions that serve the common European good. The author argues that notably the EU regulatory system is no longer

able to successfully manage complex policies as in the case of R&D or innovation and is in strong need of overhaul.

Jean-Claude Thoenig emphasizes in his contribution that any competitive innovation ecosystem requires a stimulating higher education and research environment. Academic institutions are key contributors and stakeholders to fuel economic and societal dynamics. Building a stronger academic capacity inside the EU is an ambition. Yet, albeit the difference between the three basic models of higher education and research – the Anglo-Saxon, the German Humboldtian and the French Napoleonic model – is slowly fading away, only a dozen or so of Europe's universities may compete with their US counterparts. The EU has not yet reached a critical mass so as to build up a competitive innovation ecosystem of its own. The author outlines the steps forward necessary to make European academia a player of the highest standards.

A most unorthodox yet equally most interesting perspective on the European innovation ecosystem is opened up in Michel Praet's paper dealing with cultural diversity and political unity in Europe; two strongly intertwined forces which on the one hand determine innovation potentials and on the other hand are a result of innovative thinking. Culture and unity, both need creativity and innovation as fertile soil. Moreover, our "cultural industries" require cross-sectoral innovation and collaboration based on diversity and provide an important economic and cultural asset. Politics, Praet argues, need to foster cultural innovation and diversity lest it should fall victim to the American style of culture industries (movies, music etc.) which *per se* are much more homogeneous and streamlined not least due to the large markets they serve.

Having considered innovation policy from various perspectives, the book ends with a chapter on foresight by Stefan Schepers, who summarizes principal challenges resulting from scientific, ethical, economic, ecological and geo-political developments. Foresight strengthens further the ur-

gency of an innovative innovation ecosystem and governance and is a useful tool to explore the known inter-actions in complex systems, still leaving known unknowns requiring special attention. Foresight studies can play a very useful role in developing alignment between stakeholders and in overcoming short-termism of electoral politics within innovated governance systems able to deal with the 21st century's problems. The EU could use foresight to position itself as a principal actor for solution development in its own and the global interest.

Eventually, in Chapter 14 we have assembled political recommendations to EU policy-makers which are laid down in the two reports by the HLG on Innovation Policy Management, and a comment about the progress so far.

Our key conclusion is that Europe needs to work towards an innovation ecosystem which would unleash the dynamic interactions and feedbacks between the hitherto insufficiently coherent actions of the EU, national and local governments, large and small business, universities and centers of learning across borders and economic sectors. Without a quantum leap in innovation and innovation policies, we won't be able to muster our economic problems and make our industries strong enough to compete on the global level. Addressing sector-specific innovation performance in areas such as advanced manufacturing, construction, energy, telecoms, pharmacy, bio-tech, transport etc., will be indispensable for developing and strengthening a solid industrial base. And the most important and overarching task is to highlight the emergent narrative of a Europe unfolding its large innovation potential for pioneering and shaping our common future.

Notes

[1] In 1965 already, the COM set up a working group called PREST (*Politique de la Recherche Scientifique et Technique*) and in 1972 the internal work on a document pondering a European Technology Community had started.
[2] The EU Treaty makes explicit reference only to R&D policy. Innovation policy is not mentioned but can be derived from a wider interpretation.
[3] The European Innovation Scoreboards provide a comparative assessment of research and innovation performance in Europe. The scoreboards help countries and regions identify the areas they need to address.
[4] These acronyms stand for: ERC is the European Research Council, EIT the European Institute of Technology, JTI Joint Technology Initiatives, CIP for Competitiveness and Innovation Programme. All are part and parcel of the recent EU research policy efforts.
[5] As recent calculations yield, the ratio of R&D needed per unit of GDP has gone up from 1:1 in the early 90s to 3:1 twenty years later. Success rates of innovation still vary widely from 2.5% at the lower end to 20 % at maximum.
[6] A heterarchy is a system of organization where the elements of the organization are unranked (non-hierarchical) or where they possess the potential to be ranked a number of different ways. Definitions of the term vary among the disciplines: in social and information sciences, heterarchies are networks of elements in which each element shares the same "horizontal" position of power and authority, each playing a theoretically equal role.
[7] For example, consider antitrust laws, which were developed in the late 19th century in the context of the economic theories of the time. But today, many of those assumptions are irrelevant thereby disregarding the value of ubiquity or non-convexities in new economic theories. Or take the idea of enacting short-term tax credits for research and development. R&D takes many years. If companies invest in a given year to take advantage of the R&D credit and 2 years later the tax code is changed, their investment may be lost. Therefore tax credits do have some influence on business decisions.

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3

Icarus or Sisyphus – Innovation between Hype, Rebuff and New Sobriety

Klaus Gretschmann

I. Introduction

For the past 50 years or so, innovation: technical progress and the modernization of economies and societies has been a ground laying principle in the Western world, not least in Europe. More recently though and with the arrival of the computer, the internet, smartphones, Silicon Valley entrepreneurs and the digitalization of the world a real hype about innovation has emerged.

With the rise of new technologies new avenues towards the future, a new world of possibilities and a radical shift of our knowledge-frontiers have become a reality. Politics and institutions are making every effort to stimulate and condition innovation everywhere in our societies, economies and polities. Therefore, not surprisingly the innovation imperative (Marklund et. al., 2009) has risen to overarching prominence.

Innovation has become the "*magic formula*" in today's intellectual debates about global competition, job creation and growth, meant to help solve fundamental problems such as the financial crises, demographic developments, deadly diseases, catastrophes or air pollution, just to name a few.

In its broadest sense, innovation is more than just research or generating new ideas which may lead, or not, to a new or improved product or technology. It also covers new modes of production, delivery of services, the development of new markets, finding new sources of supply, new materials or new design, or new business models and modes of organization in industry and in public administration.

However, it is an error to assume that innovations are everywhere and always welcome. There is NO such thing as a social consensus or a social compact about the unconditional promotion of innovation. Rather, the history of innovation is an unending story of resistance and opposition (Hauschildt and Salomo, 2007: 178). The problem of barriers to innovation is not a new one, even though its forms, forces, and elements have varied over time. Already in 1912, Schumpeter referred to "a steady antagonism vis-à-vis change" in the process of creative destruction (Schumpeter, 2012:108).

This is because innovations are often accompanied and characterized by high levels of risk, uncertainty, complexity, opaqueness and fundamental change. Innovation is neither a good nor a bad thing per se; rather its assessment depends on its effects and impact on the social and economic welfare of a society, the ways that we work, live and exist.

Therefore, often innovations find both consent and support with some but may trigger massive reticence, resistance and opposition with others. Nonetheless, lip service in favor of abstract "innovation" and the call for unfolding innovation potential is *en vogue* today! Everybody who is in the public limelight, be it politicians, entrepreneurs, business leaders, scholars or association officials, is enthusiastic to demonstrate that they are on the bright side of modernizing our economies and societies.

As there will be winners and losers from any process of innovation, and since turbulences and adaptive requirements accompany every innovation, this "love of innovation" is lukewarm at best. As a matter of fact, what we can observe today are "go-getters" and "procrastinators", drivers and constraints in the "*war theater*" of innovation (Govindarajan and Trimble, 2010).

Innovation policies today are either of an *Icarus type*[1], i.e. too high-flying and falling down hard, or of the *Sisyphus kind*[2], i.e. rolling something uphill again and again but unable to hold it. The former mirrors the aggrandizement of and the hype about innovation as well as a lack of scrutiny, whilst the latter reflects a new sobriety - the continuous hard work involved and required from us all if we wish to prompt, develop and make best use of innovations.

II. Trailblazing the future: the long and stony road to innovation

In the Europe of 2015 the received view maintains that the prospects for prosperity – economic, social and environmental – over the next twenty-five years will strongly depend upon actively encouraging deep changes and tectonic shifts far greater than those experienced in the twentieth century. Realizing the full potential of tomorrow's innovations and their contribution to human well-being is considered a function of the capacity to embrace dynamic change and the stimulation of innovations across all aspects of human life.

If we wish to build our future on *innovation as a principle*, we will have to pave the way. At times it may be a high road, sometimes a thorny trail. Everything depends on the right, stimulating environment – an inspiring innovation ecosystem[3] will have to be created and unveiled.

The standard innovation policy model based on the assumption that research institutes, entrepreneurial activities and high-tech firms should be stimulated and encouraged in linear manner from

invention, to innovation and diffusion is overly simplistic. Any negative impacts should be solved through ex-post regulation and other compensatory measures. We have argued above (see chapter on innovation ecosystems) that this model is counterproductive and that a new approach is the tall order of the day:

The concept of an innovation ecosystem lays emphasis on the interaction and information flowing among a multitude of people, enterprises and institutions. Innovation is the result of the interaction amongst an ecology of actors, rules and institutions. It is the "right" interaction that is needed in order to turn an idea into a solution or a process, product or service on the market.

So, what is badly needed is collaboration between research, business, governments and also EU institutions, instead of silo thinking by each of them and mutual distrust. We must also dare to question regulatory capture by a select number of players. Instead of fragmenting responsibilities, governments should ensure convergence and cooperation.

The digital revolution has laid the groundworks for today's Great Transformation[4]: It has changed the way we work and live almost beyond recognition. As Carly Fiorina (2007: 177) has put so aptly: *"The future is digital, virtual, mobile and personal – a future in which everything physical and analog can be represented in digital form; where anything can move anywhere because it exists in cyberspace and can be networked; where virtual reality can be someday as compelling as physical reality; and where individuals can control myriad actions, events and information and knowledge on their own behalf"*.

Digital technology offers new access to production, logistics, consumption, health care and education, etc. while blurring boundaries between industries. The power of the individual will grow, new political decision modes will emerge (*internet democracy*) and new competitors will show-

up, disrupting industries and creating new business models. 20 years from now, we may look back on the present as a time when rapid and continuous innovation changed almost everything about the way we live, how we produce, consume, communicate, interact and participate in our polities.

No doubt, it will be indispensable to develop a vision of technological possibilities, involving computing, genetics, brain technology, new materials, renewable energy, transportation, environmental tools and others.

Ralph-Christian Ohr contrasts continuous and incremental innovations as evolution, with radical and discontinuous leaps to completely novel offerings, opening up new business and growth trajectories which can be described as revolution[5].

Evolution accounts for the majority of innovation activities in most firms and organizations. However, it "only" optimizes and improves existing trends and products along their trajectories. Revolutionary innovation, in turn, explores new-to-the-world opportunities and creates new business potential. Revolutionary innovators ask questions based on the limitations of existing solutions and offer new solutions to existing problems of which no one else has thought[6].

In order to remain competitive or win a new competitive edge, we do need both, revolutions and evolutions. This in turn will help to operate sustainable, efficient and socially beneficial innovations. Some innovations are at risk of failing because they might be driven in the wrong direction not aligned with the properties of the innovation ecosystem in which they operate. Consequently, the existing businesses may die, the novel idea dies, or both die.

Beyond dispute, there is a myriad of risks associated with advances in new technologies and innovative avenues towards the future. If trailblazing and pioneering for our future is the tall order of the day, we do need to tackle and control the following:

- Tomorrow's technologies may contain destructive potential that will be both powerful and difficult to control. They could pose threats to the natural and human environment.
- Through new break-through innovations the world becomes more diversified, complex and technology-dependent and a diminishing control over our physical or social systems may result.
- Problems loom related to ethics, values and mindsets. Innovative technologies such as human cloning or artificial intelligence will pose major challenges to ethical and cultural standards, and will strain people's tolerance of the novel and unknown.
- Closely related is the risk of over- or under-regulation of new developments. Either can thwart the desirable or fail to constrain the undesirable.
- The enthusiast who is so optimistic about an innovation that he neglects the social, economic and political constraints and overlooks the secondary/side effects of innovations may jeopardize innovations.
- In a similar vein, a very recent study by VCI (2015) concludes that business and politics are equally required to improve the framework conditions for making "innovation tick".
- This involves primarily the fostering of a "culture of innovation" and of society's open-mindedness vis-a-vis innovation and change.
- However, the biggest risk that we face is the failure to embrace the huge potential that new technologies and innovations hold for improving the condition of humankind and the state of nations (Coates, 1998).

We cannot neglect though that there could be an important clash between the radical possibilities opened up by innovations and technological change and vested traditions, habits and relationships. Adopting new attitudes, accepting alternative approaches to risk management and equipping people for new decision-making structures is of paramount importance for meeting the challenge of nurturing an innovation-driven economy and society and preparing them for the future.

In short: It is imperative to strengthen a culture of innovation in enterprises, universities and the society at large. Moreover, we need to raise curiosity and risk propensity. Disruptive and incremental innovation need to be equally promoted. We need to unhinge ideologies for the sake of reality and confidence and trust in science need reinforcement. Benefits and risks must be communicated freely and honestly. This all makes up the essence of trailblazing the future through innovations in the face of major obstacles and sometimes fierce opposition.

III. Skepticism, opposition and barriers to innovation

1. Factors inhibiting innovation

In spite of lip service to the contrary, skepticism vis-a-vis technological modernization and often outright refusal to accept new knowledge and complex innovations prevail. At all levels of innovation policy and management opposition can be found. There is no generic "welcome culture" for innovation in Europe.

In order to promote our ability to innovate we need to identify, analyze and anticipate barriers and opposition to innovation. The following key factors for either stimulating or inhibiting innovation have been identified in the literature (see list below). These factors have a cumulative influence on any innovation.

Barriers and obstacles to innovation:

- Personal attitudes to change
- Organizational openness and innovation culture
- Regulations and bureaucracy (licensing, approving authorities)
- Asset availability (skills, knowledge, manpower, finance)
- Risk propensity or aversion
- Social acceptance (for health, environment, social etc. impact)
- The number and strength of veto players
- A sound and fully fledged innovation ecosystem.

As depicted in Figure A which is derived from a broad body of diverse literature, factors have been merged and weights have been attached in terms of percentage values of their "barrier significance": Intrafirm obstacles count 15%, market forces 15%, user reticence 10%, regulations 25 %, social acceptability 30% and miscellaneous 5% (author's own estimates, KG).

Figure 3.1: Capability to Innovate as a Function of Opposing Forces

(100% opposition standing for complete paralysis; 0% opposition indicating full mobilization)

FIGURE 3.1 HERE FILE SEPARATE

Personal obstacles, e.g. career outlooks, job security, promotion, rise or fall in the firm's hierarchy etc., go hand in hand with organizational impediments, such as coordination among departments, the NIH syndrome[7], loss of departmental power and influence etc., with technical frictions, i.e. how a new product, business model etc. affects organizational processes and stability and last but not least vested powers and interests. Additionally, project management and funding requirements (at whose cost?) may cause trouble – also under the heading "intrafirm barriers".

Moreover, as emphasized in the theory of veto players (Tsibelis, 2002) it is particularly important to identify those parties and agents which are powerful enough to block the development and implementation of path-breaking decisions and ideas: A veto player is a person, group or institution whose agreement or consent is indispensable for any decision or measure necessary for change. In other words: veto players can block innovations. If veto players are in the game, three parameters measure their power: (1) their number (2) their internal cohesion and political/economic or social weight (3) the policy congruence among them and with society at large.[8]

But these are not the only barriers and obstacles to innovation.

As a recent study by German VCI (2015)[9] has shown convincingly, internal opposition in enterprises, research institutions or administrations is only one side of the coin. Even more important, seem to be external obstacles such as regulations and bureaucracy, licensing and clearance, the social acceptance or the general cooperation and political support (VCI 2015, p. 52). Some obstacles work cumulatively against innovations: approving authorities are reticent and stall for time whenever interest groups of civic society spell out resistance, when doubts are expressed about externalities and impacts or when competitors ponder complaints in terms of competition law and other issues. A long process of risk assessment is then to be expected. Examples abound: crops

and genetic engineering, pharma and drugs, clinical studies, genomics, nanotech, use of big data etc.

Better communication, information, cooperation and dialogue between science, industry, politics and civil society combined with rigorous innovation impact assessment may be a means to attenuate such opposition and forces of inertia. An honest and pristine balance between risks and benefits (RRR) of innovations may help to put social concerns at ease and make scientific analysis more credible and authentic.

Misconceived and rigid regulation is a major impediment to innovation. As a general rule, regulation results from a long thought and consensus building process among political decision makers, with more or less successful involvement of a variety of – skeptical -stakeholders. It is based on the calculation of so-called "external costs"[10] and their effect on a social welfare function[11].

Some spectacular accidents such as Bophal, Seveso, river pollution, diseases etc. brought issues which had been previously the exclusive domain of scientists and experts into the public limelight and thus to political attention.

(Un)fortunately nothing lasts forever and the rapid evolvement of scientific discovery and innovation can make existing regulation obsolete. Institutional and legal inertia often prevents timely regulatory innovation and change. Just continuing a particular regulatory trajectory without regular checks of its impact and costs, and without re-examination of the goals and objectives themselves, is fundamental to hindering innovation and a main barrier to modernization.

2. Resistance to change

One of the best approaches to explain resistance to or acceptance of innovations can be found in Gatignon and Robertson (1991). The authors consider multiple areas where resistance to innova-

tions occurs before and throughout the innovation process and they understand resistance to innovation as a special case of general resistance to change.

For many of those involved, innovation means change, notably a kind of change to which they will be subject and the implications of which they can neither understand nor control. Thereby, reticence and resistance arises.

No matter whether triggered externally or internally, every initial response by individuals or organizations is either resistance or openness depending on personal or institutional preconditions. On the individual level, the reaction of those involved and affected by an innovation often prompts an emotional and spontaneous response of rejection, protest, or even active boycotting. Although active resistance can also occur rationally, i.e. after careful deliberation, more often than not it is determined by norms, standards, values and seasoned patterns of institutional response. For example, commitment to religious principles may prompt some to resist certain medical practices, irrespective of their technical merit, or membership of a labor union demands resistance to innovations which might jeopardize jobs and employment. In such cases, group norms and institutional identification can pre-determine resistance to or acceptance of innovations (Turner, 1991). Today ***"Groupthink"*** (Janis, 1982: 244), is a major threat to any innovation, often disguised in rational arguments and criticism of scientific research methods.

This phenomenon can be observed within groups of people, in social networks or in organizations of the civic society, in which the desire for intra-group harmony and conformity results in an irrational or dysfunctional outcome. Group members try to minimize conflict and reach a consensus without critical evaluation of alternative viewpoints, by actively suppressing dissenting opinions, and by isolating themselves from outside influences.

Whereas the media coverage often focusses primarily on the negative reactions to innovations, recent surveys show that the basic attitudes of the citizens in Europe vis-à-vis Science and Technology are primarily positive. As depicted in Figure B there is both a strong interest in S&T and an overwhelmingly positive feeling about the impact of S&T in the European Union.

Figure 3.2: Survey EU Citizens' Attitudes to Science and Technology[12]

FIGURE 3.2 HERE SEPARATE FILE

To be sure, attitudes and reactions with respect to innovations are often based on incomplete and biased information, distorted communication and a lack of knowledge on the part of the respondents. Therefore, attention must be paid to both preconditioned attitudes of resistance or acceptance and the ways benefits and risks are communicated. As it happens, innovations include continuous or discontinuous change, and resistance to change is inevitably higher against the latter: discontinuities and break-ups are more difficult to swallow than smooth, non-disruptive transformation.

3. Risk and attitudes to innovation

As Guenther Dueck (2013) has argued convincingly, four types of players can be identified by their attitudes vis-a-vis novel ideas and innovations: (a) *Frontrunners and aficionados* who are eager to see new things and ideas developed, accomplished and tested. This is a very small group. (b) *Open Minds*, i.e. people who are receptive to new ideas but who do not wish to be protagonists and pioneers but rather followers. This is a pretty large group. (c) *Close Minds* are those

who are rather skeptical and distrusting of novel ideas and technological progress, and who will follow suit only when a large number of proponents is already leading the way. (d) *Antagonists* are principally hostile and negative to anything new and remain strictly opposed to novelties.

Factors which determine a positive attitude vis-a-vis an innovation or at least help create a constructive attitude have been identified by Rogers (2003, S. 222 f.):

- personal advantages from innovations
- a high degree of compatibility with personal, environmental and organizational and ideological predispositions
- a good understanding and low complexity of an innovation
- testability, observability and affinity

On top I regard the following factors as decisive:

- positive reference groups and social networks
- charismatic leaders and convincing promotors
- a general pro-innovative societal spirit

If these factors exist, we may assume a high probability for acceptance and a positive attitude in favor of innovations and change (Siegrist, 2008).

Opposition to change is never solely built on emotional and psychological dispositions. Rather cognitive and rational arguments play a major role, and notably the perception and management of risks. An honest and unobstructed discussion about the risk from novel ideas, products technologies or business processes is indispensable. And we may need a critical mass of rational arguments put forward by proponents and promotors to make an innovation work, accomplish and enforceable (Currall, 2006).

Siegrist et. al. (2010) have pointed out that “laymen’s” risk perceptions often differ starkly from experts’ assessments of risks. Yet, the vision of both groups needs to be taken into account in order to deal successfully with risk driven opposition. As beliefs can be corrected only by personal experience and most people have no experience with innovations and their consequences, trust plays a major role. Those concerned or affected by innovations must rely on reassurances made by expert scientists whose “language” they hardly understand. Only trust in experts can help moderate the process of social amplification as described in the seminal work of Slovic and others (Pidgeons et. al., 2003).

Slovic (2000) pointed out that high public concern about a risk issue – be it nuclear energy, fracking, biotech etc. – is associated with distrust of the “industry managers” responsible for the issue whilst low public concern, e.g. medical use of radiation, is associated with trust in risk managers (doctors). So, trust in risk management is negatively correlated to risk perception. In the same vein, any success or failure of risk communication largely depends on whether or not there are trusted communicators.

Against this backdrop, we see innovation and risk management being viewed as partners, not adversaries. When properly fused, the two areas can help organizations and polities pursue opportunities that risk-averse attitudes might leave in the drawing room.

Help to overcome risk problems associated with innovation may also come from the State:

As innovations and the development of new technologies do require a vision, a mission and lots of money spent from upstream research to downstream commercialization, all accompanied by serious risks, the State can act as risk absorber, agenda setter, stimulator and “enforcer against opposition”.

Since as a rule, the private sector or the venture capital industry is often much more risk-averse than government agencies, it is easier for the latter to fund capital-intensive and high-risk projects through public money, thereby socializing some of the financial risks through taxation. This active — and often catalytic — role governments assume to cover risky investments in future technologies is excellently described and analyzed in Mazzucato's work (2013) about the entrepreneurial state.

One way to attenuate the role of risk as an impediment to innovation might be the use of qualitative 'Risk/Reward Ratios' to deal with related promises and perils:

Borrowed from financial investment theory, a risk-reward-ratio is used by many investors to compare the expected returns of an investment to the amount of risk undertaken to capture these returns. What we need in order to cope with innovation resistance is a kind of social and qualitative RRR.

Such an RRR would take into account on the one hand the social (perceived) risks from innovations) and on the other hand the (expected) social rate of return, i.e. the collective reward from an innovation. As shown in Figure C below, in a 4 quadrant matrix, several possibilities exist:

FIGURE 3.3 HERE SEPARATE FILE

When both risk and reward are low, as in Q1, no incentive and no opposition will exist, innovations are unlikely. When reward is low and risk is high – as in Q2 - innovations will not materialize. Q3 depicts a constellation in which risk is low and the social rate of return is high, here innovations are unhindered and will be promoted without doubt. The most difficult problems arise in

Q4 where both the rewards and the risks are high. Here we are faced with a clear trade-off, which is hard to balance.

IV. Europe - prototype of the risk-averse society?

1. The changing concept and context of risk

Today Europe seems to be moving towards a *risk avoidance culture* rather than towards *a risk management culture*. Instead of understanding risks as potential sources of human progress and technological development, today risk connotes dread, uncertainty, instability, dangers and threats. In such context it is often conceived as a prime obstacle to innovation.

It has not always been like this! From Gutenberg's printing press to CERN's accelerating protons, from Pythagoras' theorems to Marconi's radio, Europe can look back on a proud tradition of entrepreneurship and discovery. Throughout the centuries, the relentless pursuit of new knowledge and innovative ways of doing things is what made our societies strong, prosperous and safe.

However, when investors buy stock, surgeons perform operations, engineers design machines, entrepreneurs launch new businesses, astronauts explore space or politicians run for office, risk is an inescapable companion. Whereas in the past centuries risk was perceived as a force of fate in the face of which we seemed helplessly in the hands of the Gods' mercy, modern times are characterized by a change in the perception of risk as calculable and controllable, weighing and measuring its consequences, unleashing an approach which considers risks as opposed to opportunities. As Peter Bernstein (1996:1) in his seminal book "*Against the Gods. The remarkable sto-*

ry of risk" has put it distinctly: *"The revolutionary idea that defines the boundary between modern times and the past is the mastery of risk".*

Indeed, the concept of risk has undergone a radical transformation. Today's concept of risk is a product of modern times and did not exist in this form before the industrial revolution in the 19th century. Until then, people knew dangers as natural phenomena, such as hunger, illness or natural catastrophes, and attributed these dangers to external powers, lying outside of human decision or influence.

Industrialization challenged the idea of risk and danger as purely natural phenomena and subsequently replaced it with the notion of risk being created by humans themselves. This occurred with the rise of science, technology and new mathematical techniques especially in the field of contingency analysis, which created a new approach to risk and its assessment.

Industrialization shifted the responsibility from God to humans and their decisions and actions. As Frank Furedi pointed out (2005), natural disasters are no longer seen as "natural" events, but people automatically suspect human responsibility behind a catastrophe, so that they get redefined as preventable.

Graubard (1990: v) explains: "*It is perfectly obvious that the concept of "risk" has taken on wholly new dimensions in recent decades and is today being reflected on in ways that would have been almost inconceivable even a few years ago. The older idea, that risk is essentially a wager, which individuals take in the hope of gaining something significant, substantial, has almost disappeared from common parlance."*

In a most brilliant paper Stefan Schepers (2010) analyzed the problems of risk averse western societies. He identified the increasing difficulties between industry and EU institutions and governments about risk assessment and management, the introduction of precautionary principles in the EU Treaties and the move towards a hazard based approach, based on deep-rooted cultural

changes in western society. We can observe widespread doubt about the advances of science and technology which are seen to produce new risks manufactured by various industries, which may potentially affect everyone and are creating a high degree of social uncertainty. Schepers concludes that scientific argumentation alone does not suffice to provide an impartial and sober reflection of reality **as risk perception is itself a social construct.**

2. The Precautionary Principle

Over the last 2-3 decades, the European risk regime has changed significantly. Regulatory politics and policies have not only become more visible and contentious, but they have also become more stringent and risk averse, particularly compared to other parts of the world like the U.S. and Asia.

Regulations reflect this trend towards ever stricter interpretations of risk, increasing the time and impediments to access the market for needed medicines, alimentation and new technologies. Thereby, the EU itself is often seen as contributing to a climate of increased risk aversion and playing a major role in changing the quality and dynamics of European regulatory policies. The most notorious result thereof is probably the unconditional use of the precautionary principle[13] enshrined in the EU Treaties in 1999, by which the EU laid the groundworks for its general approach to risk. According to the Commission the precautionary principle[14] may be invoked when a phenomenon, product or process may have a dangerous effect, identified by a scientific and objective evaluation, if this evaluation does not allow the risk to be determined with sufficient certainty.

Although the Commission emphasizes the importance of "*finding the correct balance so that proportionate, non-discriminatory, transparent and coherent decisions can be arrived at*" to provide the required protection and allow for innovative development, the reality is unfortu-

nately somewhat different. The potentially negative effects on innovation result from the fact that by focusing primarily if not exclusively on possible risks and dangers, the precautionary principle disregards those dangers that might occur, or could be exacerbated, if new technological development is hindered and prevented.

The precautionary principle is Europe's risk policy framework and guideline for policy makers on how to assess and manage risk and uncertainty. Initially developed in the context of environmental protection, the principle has gradually found application in other fields of policy such as human health, food, genetically modified organisms (GMOs), chemicals, etc. According to the Commission, the principle has the following objective:

"Finding the correct balance so that proportionate, non-discriminatory, transparent and coherent decisions can be arrived at, which at the same time provide the chosen level of protection, requires a structured decision making process with detailed scientific and other objective information. This structure is provided by the three elements of risk analysis: the assessment of risk, the choice of risk management strategy and the communication of the risk."

The emphasis on the precautionary principle must be seen as related to the rise of the civil society and NGO movements in the Western world. Essentially a specific development took place in the last couple of decades and produced a new set of societal norms, values and expectations. These led to a redistribution of power between citizens and governments accompanied by an increasing lack of trust in public authorities and public bodies.

The most prominent criticism of the precautionary principle concerns its most essential notion, namely that it reverses the burden of proof, so that those proposing a new technology, for instance, have to assure that it will not cause any damage. It provides governments with the possibility to impose regulatory measures based upon the barest potential of harm, be it to humans

or the environment. These measures can be taken even if there is no strictly scientific proof and detrimental effects from political intervention cannot be excluded[15].

In its most radical form the precautionary principle compels the innovator to prove that his innovation will (by 100% surety) never cause any harm whatsoever to public health or the environment before it can be allowed to enter society.

Its potentially negative effects on innovation results from the fact that by focusing exclusively on possible risks and dangers, the principle disregards those dangers that might occur, or could be exacerbated, if new technological development is hindered. The precautionary principle thus risks missing its actual purpose – the protection of humans and the environment – and creating even more risks, or more dangerous ones.

As Peter J. May (2003) pointed out that, "*any regulatory regime entails finding a balance between how tight controls should be in promoting consistency and accountability versus how much discretion should be granted in promoting flexibility and innovation. The prescriptive approach emphasizes control and accountability (whereas) the performance-based approach desires to promote flexibility with accountability for results"*. Unlike in many other parts of the world which move towards, or have already implemented, a performance-based and differentiated sectorial-based approach, the prescriptive approach is predominant in Europe.

Against this backdrop, in 2013 twelve of the largest corporations in Europe submitted a letter to the European Commission (EC), urging them to adopt an "Innovation Principle"[16] as a counterweight to the precautionary principle to be taken into full consideration during policy and legislative processes.

The principle is meant to ensure that whenever policy or regulatory decisions are under consideration ***their impact on innovation*** should be assessed and addressed. It sets out to provide a

new and positive way of ensuring that policymakers fully recognize social and economic needs for both precaution and innovation. It is therefore intended to be used to improve the quality and application of EU legislation and as a result, to stimulate confidence, investment and innovation by balancing risk of innovation and of hindering innovation.

V. How to communicate innovation: respect opponents, mobilize proponents and rely on honest brokers

Albeit often recommended as a remedy, information and communication will not suffice to overcome prejudice and preconceptions. More importantly, communicated trust and beliefs are indispensable means to help reach a more balanced verdict on any innovation.

What is required for a fair assessment of both the potential and the perils is an early dialogue between civil society, politics, economics and business. Politicians will have to alter their widespread role as doubters and objection raisers into the roles of mediators and honest brokers who should equally emphasize the gains and virtues of innovations and new technologies and their possible risks and perils, where they exist.

Public suspicion of governments' ability to deal with danger and risk is reinforced by deficient communication. Governments still tend to rely on outdated models of risk communication, and view the public as an essentially naïve audience. In this vein a one way process is usually applied: a huge amount of technical and scientific data is just thrown at and disseminated to the public in a desperate effort to raise "understanding", to counteract 'irrational' opinions and to build support. (Botterill and Mazur, 2004).

This approach does not go down well with academia and civil society as it runs the danger of making assessment subject to government or industry interests. More successful communication strategies call for a more democratic and differentiated approach and focus mainly on three dimensions (Slovic, 1999):

- the complexity of the risk concept and the inadequacies of viewing risk analysis as an exclusively scientific enterprise;
- the recognition that risk and risk assessment are socially constructed; hence science and technical judgements are blended with important political, social and cultural factors;
- the appreciation that the way in which risk is defined and by whom is central to how assessment, management and communication materialize.

Moreover, scientific research alone will never suffice to convincingly communicate either the benefits or the risks of an innovation. Scientists and engineers should work to establish the objective facts and figures whilst it is vital that social scientists and communication experts work on how the public perceives and appraises new ideas, technologies or innovations.

That an inconspicuous attitude, the non-meddling and the non-communication by scientists may be crucial for the general public to refuse an innovation has been emphasized by John Entine (2011):

"Scientists have largely remained silent when the public discussion turns to the tradeoff of benefits and risks (…). They are often unwilling to engage in controversial issues that could endanger their funding and research (…). The public interprets the unwillingness of scientists to engage those who campaign against chemicals as an implicit validation of their dangers. Those who do speak out are often (…) branded as industry apologists. Maybe the best we can hope for is that brave scientists, scientifically literate journalists and government officials, who are responsible

for translating science into regulatory policy, will take the public's best interest into account (… and) resist the irrational and often regressive impulse stirred by the scare tactics that are so common today."

In order to turn destructive into constructive opposition, promotors need be found - expert and knowledge promotors, power promotors and process or relation promotors (Hauschildt 1999) - who are able to reduce the "distance" between proponents and opponents and promote mutual understanding. According to Hauschildt and Chakrabadi (1988) power promotors are able to pull the strings in an organization due to their hierarchical position and thereby can enforce innovation processes upon "refuseniks" and "Luddites". Knowledge promotors track down and fix weaknesses and constructive glitches. In doing so they can communicate the usefulness or significance of an innovation and convince procrastinators. Process promotors are key as mediators between power and knowledge promotors: They also act as a link between intra-organizational and outside administrative forces and help with a smooth change of innovation processes and attitudes of those involved. Such a promotor model is required on all levels, be it in firms, in research institutions, in politics etc. (Hauschildt and Salomo, 2007: 207)

Efforts have to be made to involve well-reputed academic bodies, such as the Royal Society in the UK, the NSF in the USA, the ERC, the DFG, Frauenhofer or the European Academy of the Sciences and the Arts for using the current state of knowledge for innovation assessment. Inter-agency 'impact subgroups" could be formed to coordinate communication and information and to organize public outreach and media work. It is indispensable to redouble efforts to be thorough, transparent, timely and honest in disseminating and communicating results.

We seem to be living in a world out of balance – a surplus of politics and ideology and a deficit of ideas and scientific rigor. Such a world where ideologies prevail and rationality is

bounded needs radical overhaul in order to succeed in creating a successful and sustainable innovation society in Europe.

Notes

[1] According to Greek mythology, Icarus dared to fly too near the Sun on wings of feathers and wax. In spite of warnings that the Sun would cause the wax to melt, he became ecstatic with the ability to fly and ignored the warning. The feathers came loose and Icarus plunged to his death in the sea.

[2] For various crimes against the gods, Sisyphus, king of Corinth, was condemned to an eternity of hard labor. His assignment was to roll a great boulder to the top of a hill. Every time Sisyphus, by the greatest of exertion and toil, attained the summit, the boulder rolled back down and the labor and troubles started all over again.

[3] In this volume see the chapter ”Rethinking and revolutionizing European innovation by means of Innovation Ecosystems”

[4] The original “Great Transformation” is the seminal work of Karl Polanyi, which was first published in 1944. It deals with the social and political upheavals that took place in England during the rise of the market economy.

[5] See http://timkastelle.org/blog/2012/08/evolutionary-and-revolutionary-innovation/

[6] Robert Kennedy so nicely paraphrased a quote by George Bernard Shaw: “Some people see things as they are and say why? I dream things that never were and say why not?”

[7] The not-invented-here (NIH) syndrome refers to internal resistance in a company against externally developed knowledge. Although previous research has shown that firms can benefit significantly from external knowledge inflows in terms of firm performance and innovativeness such positive effects from external knowledge sourcing cannot be taken for granted. The adaption of external knowledge requires flexible processes facilitating changes in the company’s vision, strategy and culture and a welcoming attitude of employees towards externally generated knowledge. If such an attitude of the employees is missing they can show resistance against external knowledge. and the expected benefits for the company fail to realize: this is the essence of the NIH syndrome. Hussinger, Wastyn (2011), ZEW STUDY http://ftp.zew.de/pub/zew-docs/dp/dp11048.pdf

[8] For the case of Germany, R.G. Heinze has convincingly analyzed such mechanisms leading to a “blocked society” not able to react flexibly to change pressure and new opportunities.

[9] Innovationen den Weg ebnen (2015, 14 Sept), *https://www.**vci**.de/services/.../**vci-innovation**sstudie-langfassung.jsp*

[10] An external cost occurs when producing or consuming a good or service. This imposes a cost upon a third party.

[11] A social welfare function describes the state of well-being of a society and ranks social states as more or less desirable for every effect from political measures or decisions. Inputs of the function include any variables considered to affect the economic welfare of the society as a whole.

[12] 28 Member States; 27563 respondents; year: Nov. 2013); http://europa.eu/rapid/press-release_IP-13-1075_en.htm

[13] See http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=URISERV:l32042
consumer policy and European legislation concerning food and human, animal and plant health.

[14] The precautionary principle is detailed in Article 191 of the Treaty on the Functioning of the European Union (EU). It aims at ensuring a higher level of environmental protection through preventative decision-taking in the case of risk. However, in practice, the scope of this principle is far wider and also covers consumer policy and European legislation concerning food and human, animal and plant health.

[15] The United States, for example, has not adopted the precautionary principle but relies on several court decisions and scientific guidelines for risk regulation (e.g. the 1980 Benzine decision). Generally speaking, before risk regulation gets enacted in the U.S., "significant risk" must be (scientifically) demonstrated. Hence, unlike the EU's proactive approach, U.S. regulation authorities wait for evidence of harm before regulating.
[16]http://www.riskforum.eu/uploads/2/5/7/1/25710097/innovation_principle_one_pager_5_march_2015.pdf

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